WATER & SEWAGE WORKS

WATER SUPPLY • INDUSTRIAL WASTE TREATMENT • SEWAGE DISPOSAL

JUNE, 1953

Billing Machine Room . . . . . .

Part of new postcard billing system of Des Moines Water Works.

ARE YOUR LINES

"Under the Hammer?"

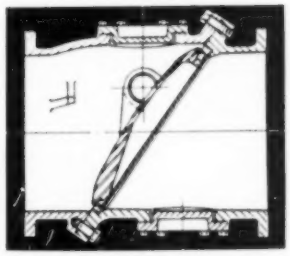
. . . here's how to get them out from under with

CHAPMAN *Tilting Disc* CHECK VALVES

Loosened pipe-joints are caused by hammering. And hammering is caused by valve-slam. But when a valve can't slam under usual piping arrangements . . . then you're free from the danger of line damage.

And this is all because of the Chapman Tilting Disc, with specially designed airfoil section that means light weight, and perfect balance in the open position, so it is easily held open in the flow . . . and then dropped quietly to a *cushioned closing* that does not even jar the line.

That's why certified tests from the country's top engineering schools and actual installations prove that Chapman Tilting Disc Check Valves reduce head-loss over regular swing-type checks. Check these tests for yourself . . . write for Catalog No. 30.



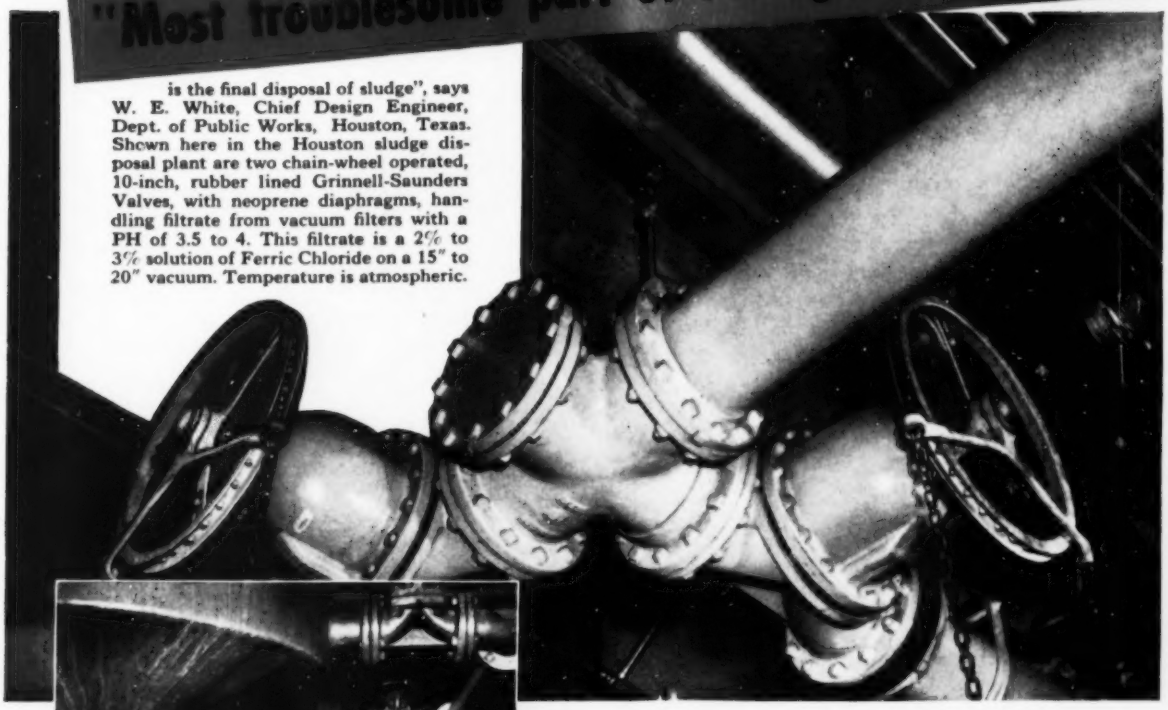
Cross-section of the Chapman Tilting-Disc Check Valve. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

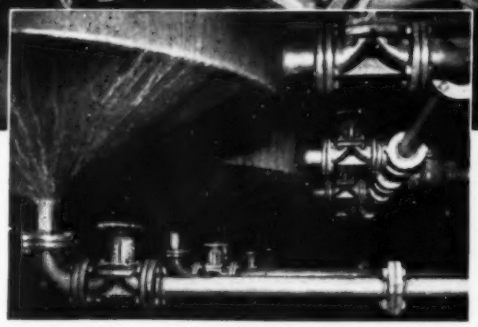
The Chapman Valve Mfg. Co.

INDIAN ORCHARD, MASSACHUSETTS

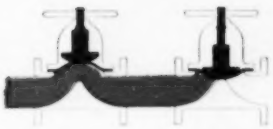
"Most troublesome part of Sewage Treatment..."

is the final disposal of sludge", says W. E. White, Chief Design Engineer, Dept. of Public Works, Houston, Texas. Shown here in the Houston sludge disposal plant are two chain-wheel operated, 10-inch, rubber lined Grinnell-Saunders Valves, with neoprene diaphragms, handling filtrate from vacuum filters with a PH of 3.5 to 4. This filtrate is a 2% to 3% solution of Ferric Chloride on a 15" to 20" vacuum. Temperature is atmospheric.





◀ In same plant. Eight 3-inch rubber lined Grinnell-Saunders Diaphragm Valves, handling 8% to 10% Ferric Chloride, at atmospheric temperature



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A job well-suited to

GRINNELL-SAUNDERS DIAPHRAGM VALVES

Streamlined flow. Smooth, streamlined passage, without pockets, prevents trapping of solids. Frictional resistance is at a minimum — regardless of direction of fluid flow. No disc holder in fluid stream.

Leak-tight closure against grit, scale, suspended solids. The resilient diaphragm, plus the large area of contact, gives leak-tight closure against pressure or vacuum.

Working parts absolutely isolated from fluid. Diaphragm completely seals off working parts from fluid in the line. No sticking, clogging or corroding of working parts. Valve lubricant cannot contaminate fluids.

Body, lining and diaphragm materials to meet service condition. Bodies stocked in cast iron, malleable iron, stainless steel, bronze and aluminum; other materials on special orders. Valve bodies lined with lead, glass, natural rubber or neoprene. Diaphragm materials of natural rubber or synthetics.

Minimum maintenance. No refacing or reseating is required. No packing glands to demand attention. New diaphragm can be inserted without removing valve body from the line.

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ALGAE CONTROL

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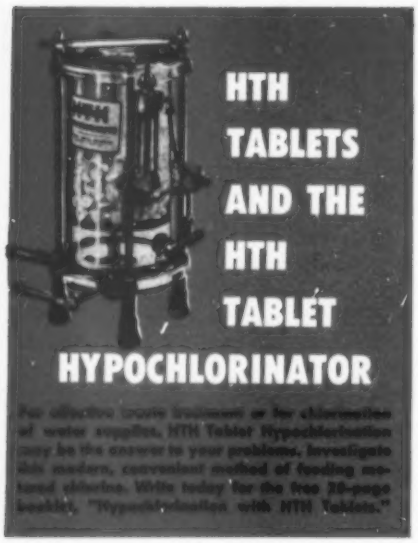

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Baltimore 3, Maryland

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WATER & SEWAGE WORKS

WATER SUPPLY • SEWAGE DISPOSAL
INDUSTRIAL WASTE TREATMENT

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Methods of Charging Communities for Treating Sewage.....*Van der Vleit*
Corrosion Control at Cedar Rapids.....*Cherry*
SAFETY in Sewage Works Operation and Sewer Maintenance.....*Van Kleeck*
Factors in the Recovery of Polluted Streams.....*Velz*
New Methods in Reservoir Construction.....*Godbe*
Algae vs the *True* Sources of Tastes and Odors.....*Silvey*
The Selection, Operation and Maintenance of Valves.....*Kaufmann*
The Case for Sludge, as a Soil Improver.....*Lunt*
Water Works Practices (short-course type articles*).....*Symons*

* In this issue is one of a series of the same type of articles on *Sewage Works Practices* by Prof. Don Bloodgood. Articles of the Symons and Bloodgood series are currently running in alternate issues.

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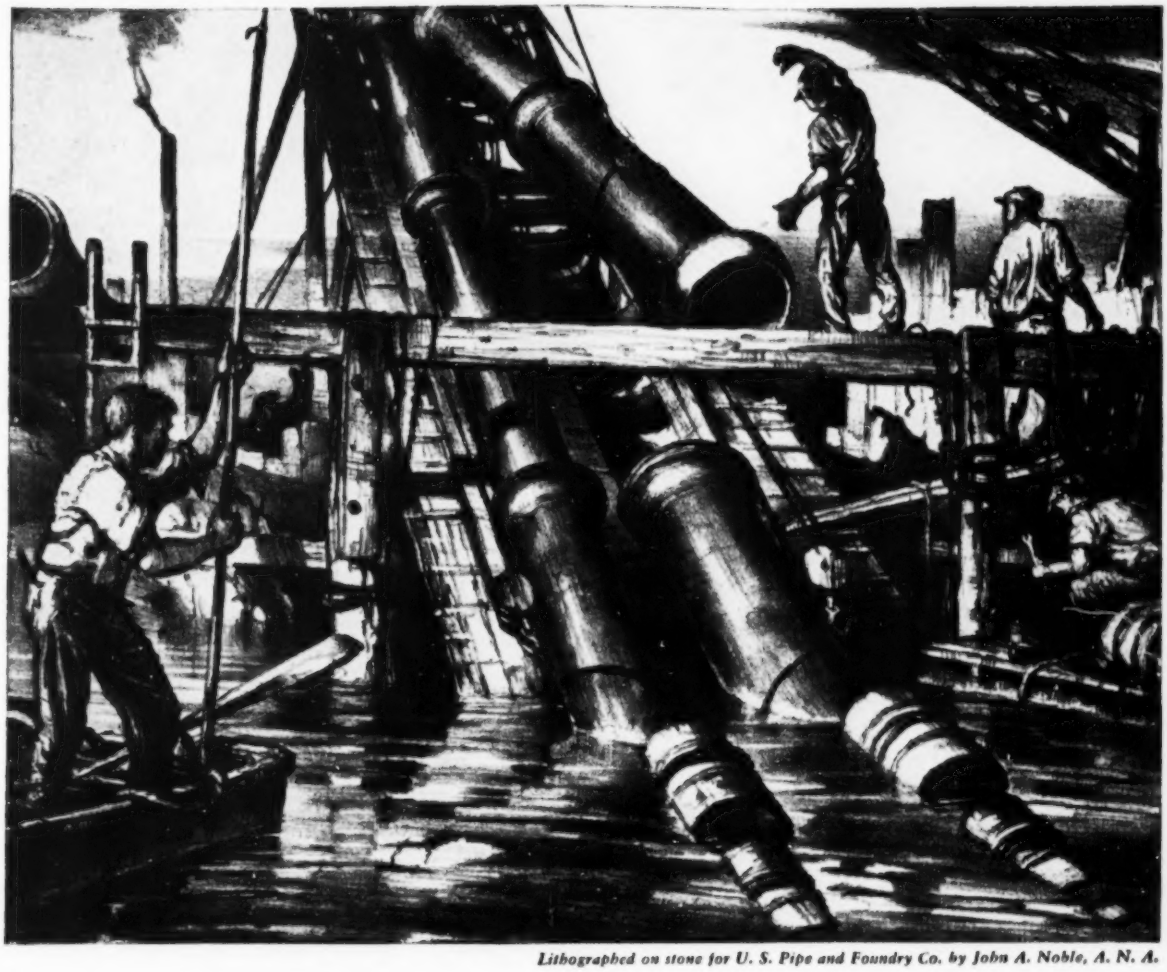

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WHEN A CAST IRON water, gas or sewer line crosses a stream flexible joint pipe is frequently used. Joints that will deflect enough to meet installation and post-installation conditions and remain tight are most important in a submarine installation.

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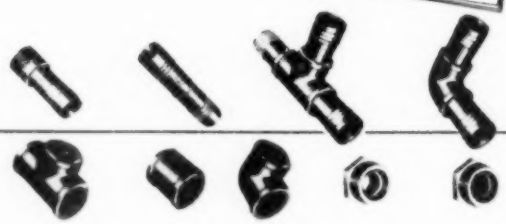

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1300-CP

• These unit assemblies or any parts of them are interchangeable with parts in these older meters. Advances in metallurgy and design have been made to improve function and lengthen life without changing dimensions.

City departments save cost by standardizing on American Meters. There are savings in stock inventory, repair time and parts cost. Meters are kept in service earning dollars — with a minimum of shop effort.

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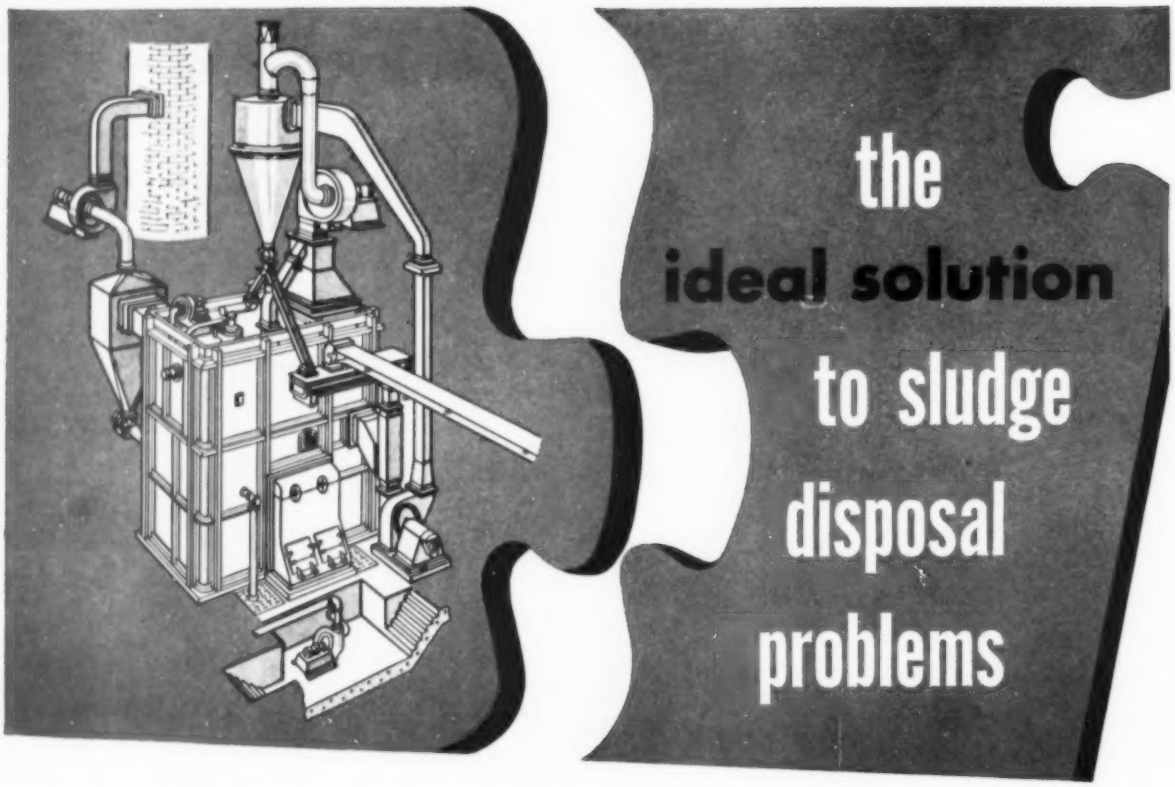
The Q-Check stencilled on pipe is the Registered Service Mark of the Cast Iron Pipe Research Association.

Modernized **cast iron**

This cast iron water main, uncovered for inspection, is in its 106th year of service in Boston, Mass.—one of more than 40 cities with century-old water or gas mains in service.

pipe *for Modern Waterworks Operation*



Here is the modern method of sludge disposal – the C-E Raymond System of Flash Drying and Incineration. Continuously, automatically, this system incinerates thickened sludge to a fine ash, free from clinker and unburned materials . . . or flash dries it to fertilizer, containing all of the original fertilizer constituents.

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C-E Raymond Systems are flexible in layout, highly efficient and fully reliable; they provide for maximum utilization of waste heat. They mean for any community the end of stream or atmospheric pollution resulting from the disposal of sewage wastes.

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reduces the operating cost of your system

IT HAS BEEN PROVED again and again—through performance records—that Transite* Pressure Pipe reduces pipe line operating costs.

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IN WATER AND SEWAGE PROJECTS

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YOU CAN PREVENT NEEDLESS WASTE

Check now for corrosion's presence. Double-check areas that may be vulnerable to *hidden corrosion*. If you would like help, an AMERCOAT Field Engineer will gladly assist you in making a thorough analysis. There is no obligation.

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CAMBRIDGE, MASS.

Cambridge Water Supply

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BOSTON, MASS.

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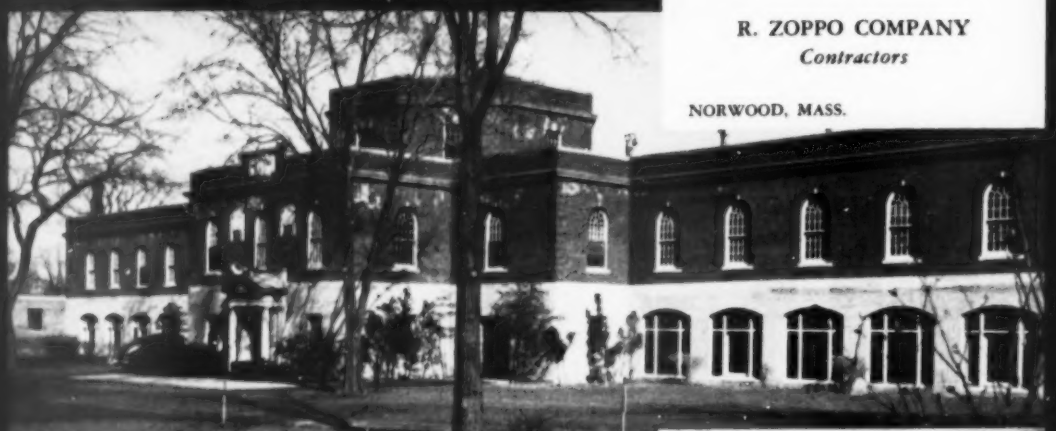
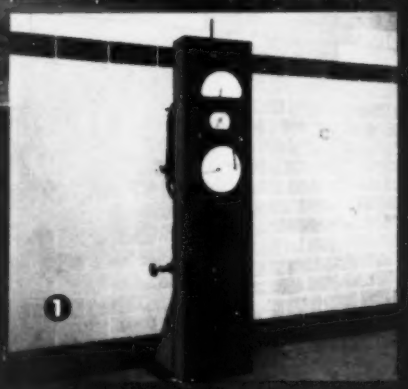
Contractors
NORWOOD, MASS.



B-I-F Industries Equipment furnished for the expansion of the Cambridge Water Supply:
Builders Venturi Tubes (sizes 30" x 15" • 20" x 10" • 16" x 7")
Builders Type M Register-Indicater-Recorders (1)
Omega Universal Feeders for hydrated lime (2)

The existing plant (1922) has Builders Meters, Controllers, Gauges, and an early Wheeler Filter Bottom installation.



capacity, (3) construction of a pumping station, and (4) establishment of connections to the Metropolitan District Commission's water supply for emergency use.

Three connections have been made with the Metropolitan District Commission system, each of which includes Builders high-efficiency Venturi Meters. These meters are used to determine proper reimbursement for MDC water used by the Cambridge Water Supply. The Cambridge Water Supply system is under the direction of William H. McGinness, Superintendent. For Bulletins describing Builders and Omega Water Works Equipment, address B-I-F Industries, Providence 1, R. I.

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B-I-F INDUSTRIES

OMEGA

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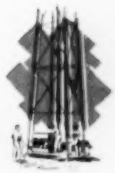

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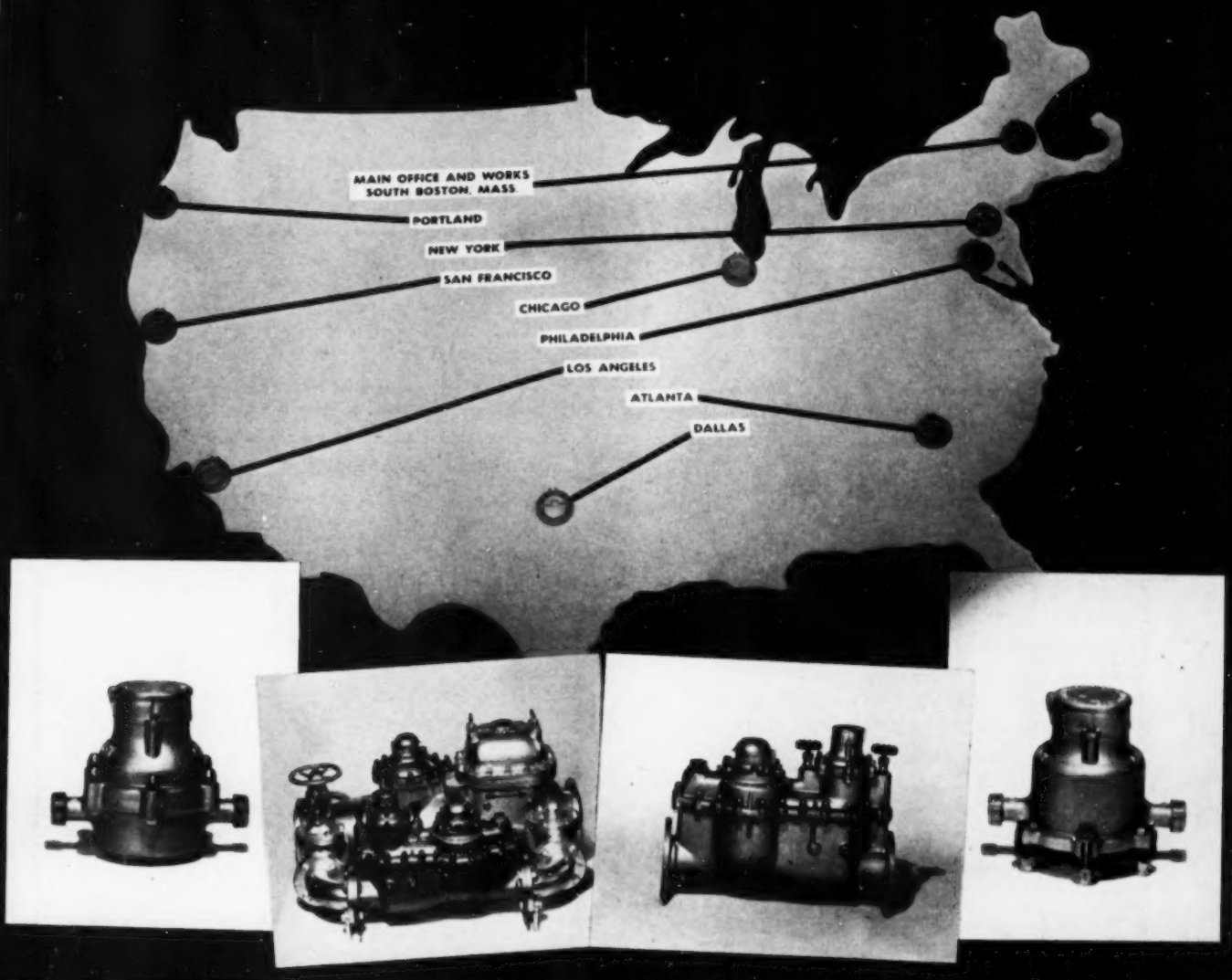
COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON



For the Convenience of

WATER WORKS OFFICIALS

The Hersey Manufacturing Company has long maintained branch establishments in the most convenient centers throughout the United States.

These branches are staffed by an efficient personnel, men who know HERSEY WATER METERS from the small Disc Meter to the giant Detector Meter.

More than 67 years of water meter experience is at your service at all of our branches. Contact the branch nearest you.

For efficient operation, accurate registration and lowest maintenance cost, HERSEY WATER METERS are the answer.

HERSEY MANUFACTURING COMPANY

SOUTH BOSTON, MASS.

BRANCH OFFICES: NEW YORK — PORTLAND, ORE. — PHILADELPHIA — ATLANTA — DALLAS — CHICAGO
SAN FRANCISCO — LOS ANGELES

Dual electrical system assures reliable power at Elm Fork

Completion of the Elm Fork Water Purification Plant represents a major stride in the water works expansion program at Dallas, Texas. Costing eight million dollars, this outstanding installation doubles the city's purified water supply. It boosts total plant capacity to 200-mgd.

Reliable electrical service at Elm Fork is assured by a secondary selective radial distribution system—adapted by Dallas' engineers, in collaboration with the consulting engineers and Westinghouse. Duplicate primary feeders, bus, transformers and switching equipment are provided. Thus, should a feeder or transformer fault occur, service is restored quickly to all loads.

Compact and unitized Westinghouse equipment was chosen for the Elm Fork system. It conserves building space . . . simplifies maintenance due to accessibility of breakers . . . can be expanded easily as loads grow.

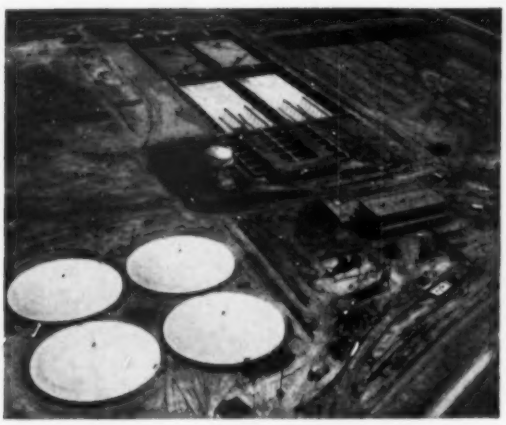
You can profit from this same kind of assistance. Whether the program calls for expansion or modernization, Westinghouse engineers are ready to help you and your engineers adapt a distribution system . . . and match it with a complete line of co-ordinated equipment.

For full details call the Construction Application Engineer at your local Westinghouse Office. Or write direct to Westinghouse Electric Corp., P.O. Box 868, Pittsburgh 30, Pa.

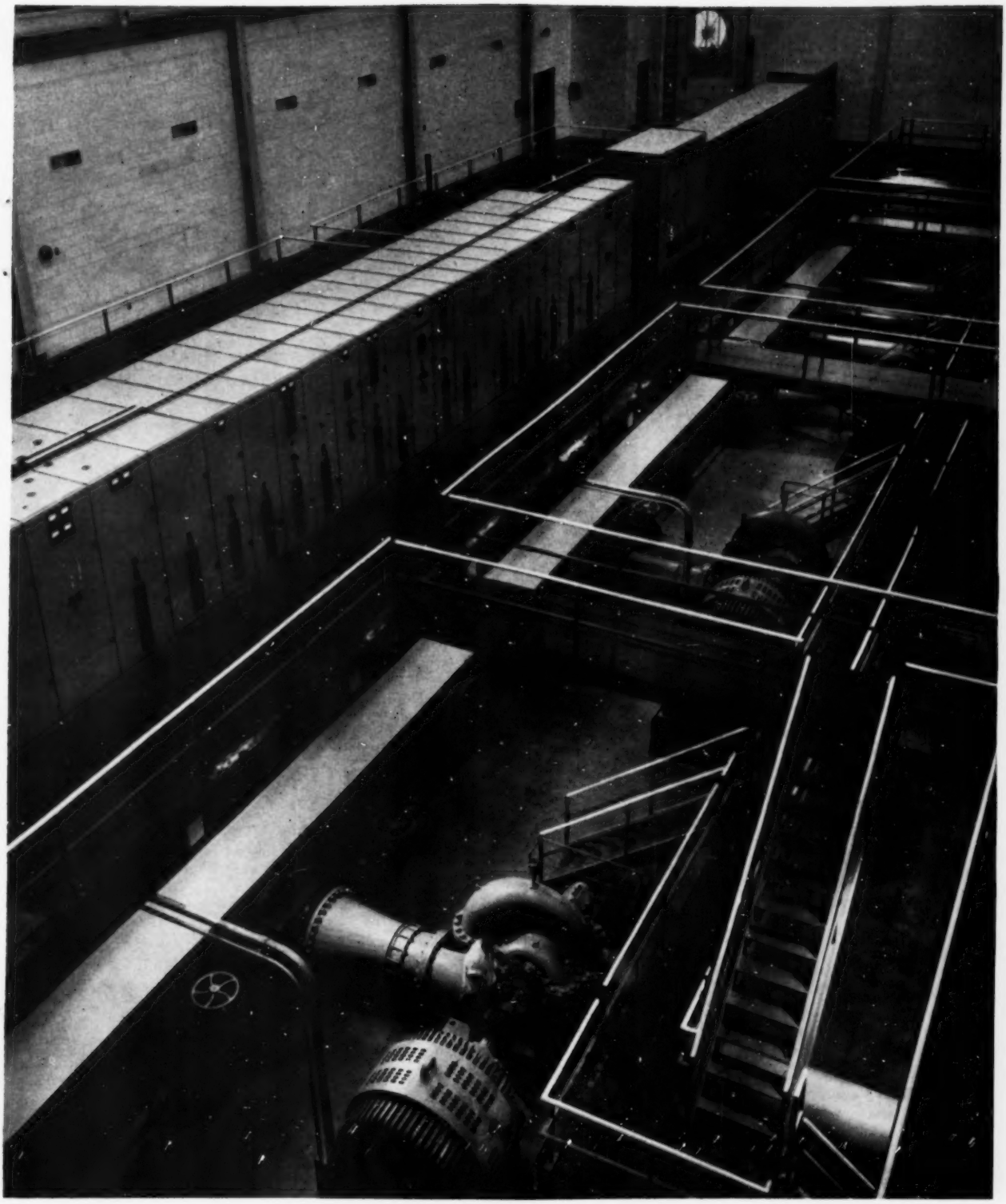
J-94993

YOU CAN BE SURE...IF IT'S Westinghouse

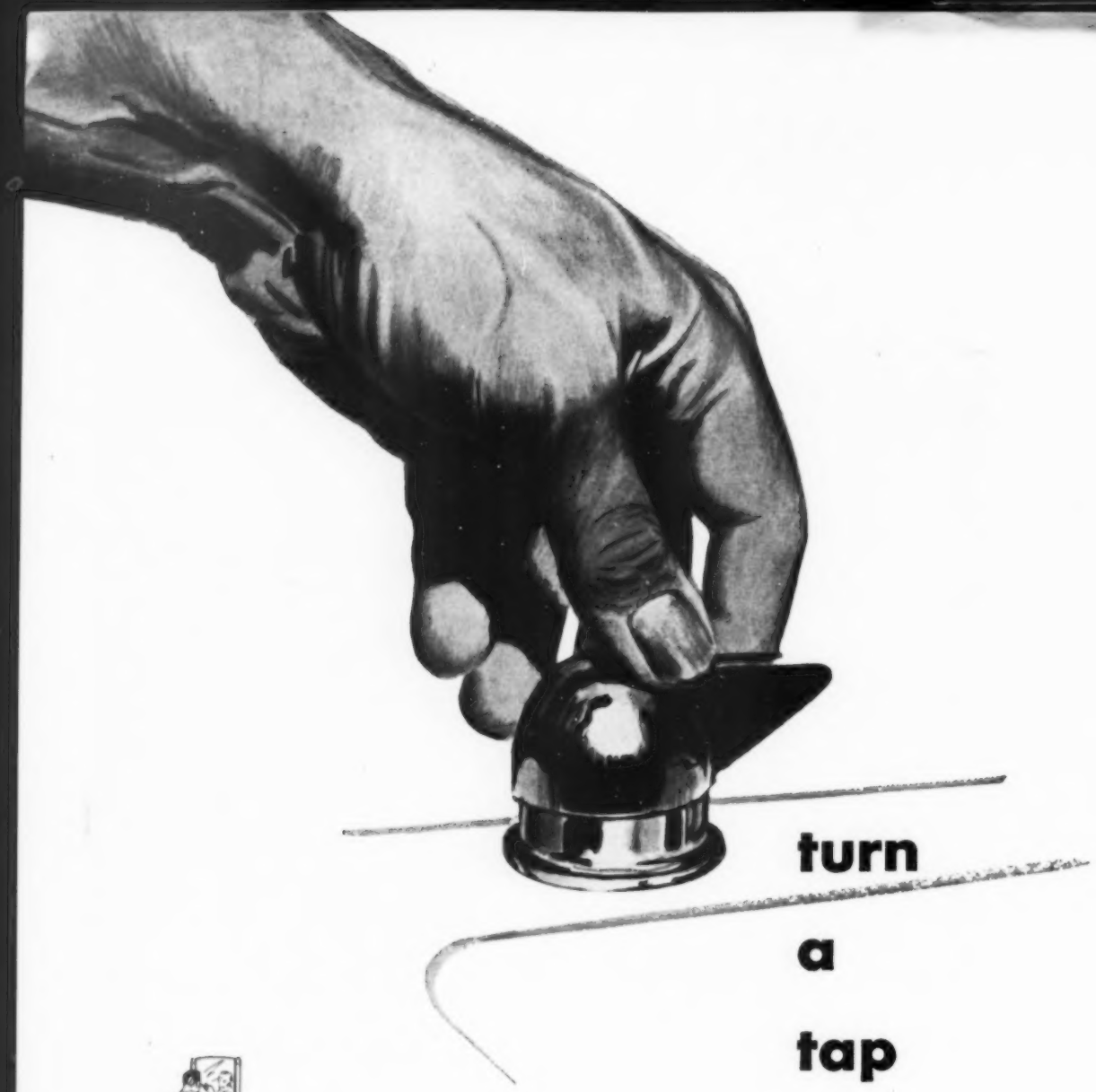
Westinghouse Battery Charger Board controls motor-generator sets which charge batteries. These supply d-c power to the swichboard relays as well as other devices in the Elm Fork electrical distribution system.



Elm Fork Water Purification Plant doubles the Dallas, Texas water supply. Along with new mains, added recently, it can be expanded easily in the future. Consulting engineers for the project: Myers & Noyes.



Westinghouse Metal-Clad Switchgear is mounted in a single line, over 100 feet long. This permits maintenance of circuit breakers and transfer of loads from front of switchboard, without power loss at any point.



turn a tap

Everyone on a water main turns a tap and expects water . . . not excuses.

That's why so many municipal water pumping stations—in small and large communities—have an independent power source.

In addition to providing dependable power in this service, Fairbanks-Morse Diesel and Dual Fuel engines are reducing pumping costs—in some cases as much as 60%.

Direct drive . . . belt or geared drive . . . electric drive . . . F-M 2-cycle engines provide the flexibility to keep the pressure up under all extremes of operating conditions. And—produce important savings in maintenance, operation and total cost per gallon pumped.

Write today for the engineering assistance of a Fairbanks-Morse municipal power specialist to help you select the right power and the right pump to fill your needs. Write to Fairbanks, Morse & Co., Chicago 5, Illinois.

FAIRBANKS-MORSE

a name worth remembering when you want the best

DIESEL AND DUAL FUEL ENGINES
DIESEL LOCOMOTIVES • RAIL CARS
ELECTRICAL MACHINERY • PUMPS
SCALES • HOME WATER SERVICE
EQUIPMENT • FARM MACHINERY
MAGNETOS

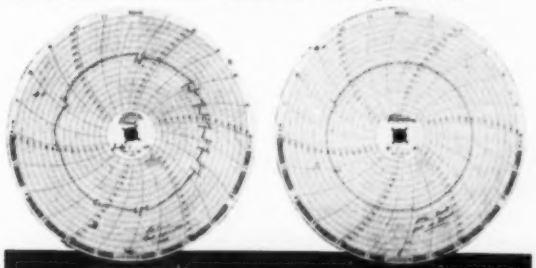
3,800,000-gal. Horton welded steel reservoir located in southern part of Battle Creek, Michigan, as shown by a star.

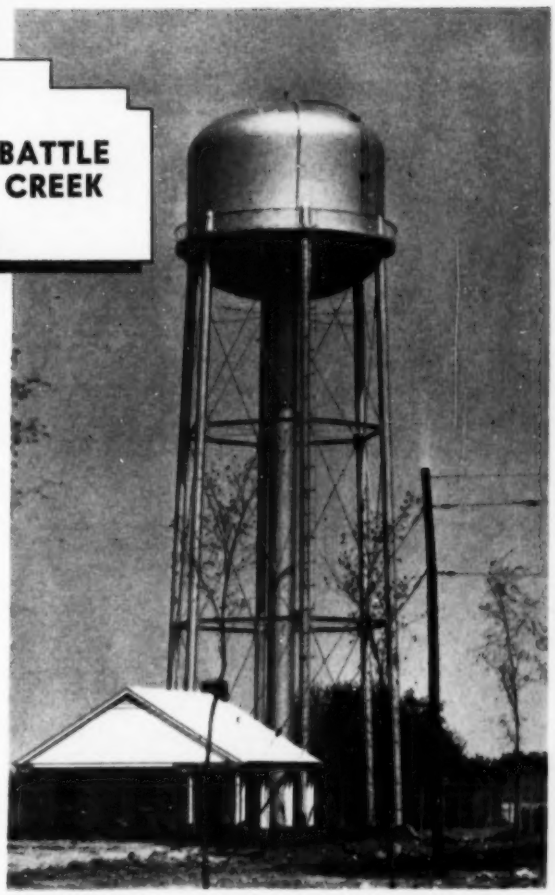
WHAT HAPPENED after BATTLE CREEK installed these two HORTON TANKS?

Through the combined efforts of two Horton tanks—water service in southwest Battle Creek has been greatly improved! Check the graphs shown below and see how pressure variations have decreased—how pressure is now kept uniformly high even during peak load periods. The 3,800,000-gallon reservoir and the 200,000-gallon elevated tank not only help supply the needs of Battle Creek today but—more important—they will continue to do so for years to come.

A Chicago Bridge & Iron Company Field Welding Supervisor is assigned to each structure to qualify welding personnel, check equipment and test welded joints. This service is provided at no extra cost to assure you of the best welded steel tanks your money can buy.

Horton elevated tanks are built in standard sizes from 5,000 to 3,000,000 gallons. Horton reservoirs are built in sizes up to 10,000,000 gallons. Please write our nearest office for information or quotations.





200,000-gal. Horton elevated water tank located in the southern part of Battle Creek, Michigan, as shown by a star.

HORTON

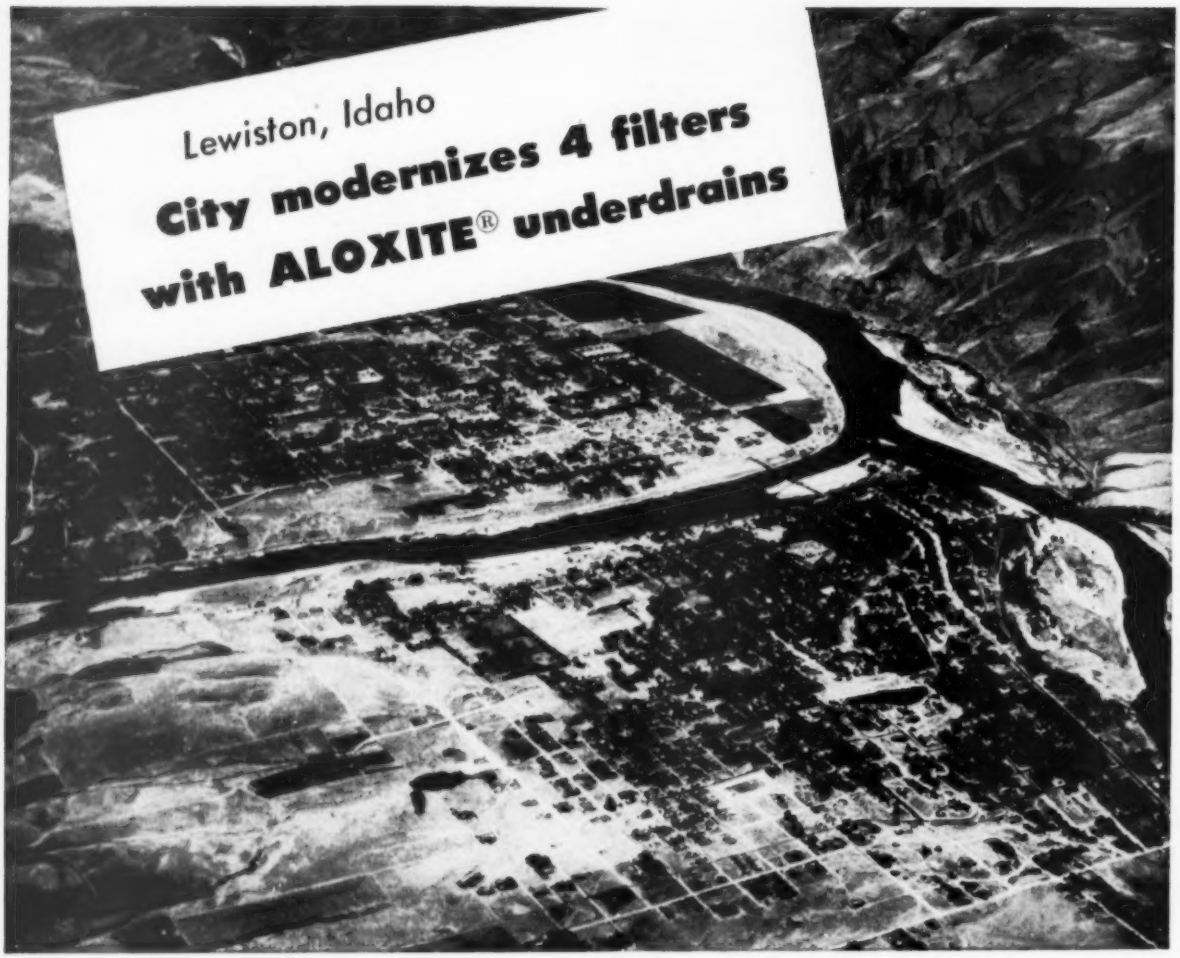
WELDED STEEL

STORAGE TANKS

CHICAGO BRIDGE & IRON COMPANY

Plants in Birmingham, Chicago, Salt Lake City, and Greenville, Pa.

Atlanta 3	2181 Healey Bldg.	Los Angeles 17	1555 General Petroleum Bldg.
Birmingham 1	1586 North Fiftieth St.	New York 6	3390—165 Broadway Bldg.
Boston 10	1048—201 Devonshire St.	Philadelphia 3	1644—1700 Walnut Street Bldg.
Chicago 4	2198 McCormick Bldg.	Pittsburgh 19	Alcoa Building
Cleveland 15	2262 Midland Bldg.	San Francisco 4	1583—200 Bush St.
Detroit 26	1551 Lafayette Bldg.	Seattle 1	1350 Henry Bldg.
Houston 2	2115 C. & I. Life Bldg.	Tulsa 3	1646 Hunt Bldg.



Information courtesy Lewiston Water Dept., Lewiston, Idaho. Photo shows Lewiston in the foreground and Clarkston, Washington in the background across the Interstate Bridge.

Lewiston, Idaho has four filters. Installed in 1924, these were originally of the conventional type with pipe lateral underdrains and graded gravel. First in 1934, and again in 1950 they required rebuilding. The beds were badly upset, the laterals clogged and corroded.

The last time the filters needed rebuilding, the Engineering Dept. decided to see if there were other, more stable types of underdrains. After investigating all systems, ALOXITE aluminum oxide porous plates were singled out as probably the best. One reason was that they seemed less difficult and less expensive to adapt to the old filter construction.

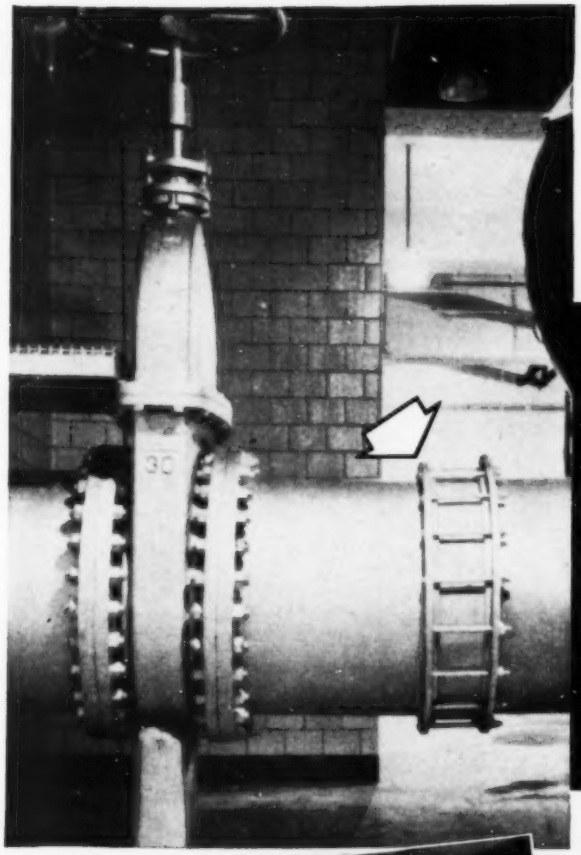
Letters were then sent to operators using these plates, inquiring as to their success in service. Many favorable replies were received, one all the way from Nykoping, Sweden—and, as a result, all four filters were modernized with ALOXITE porous-plate bottoms.

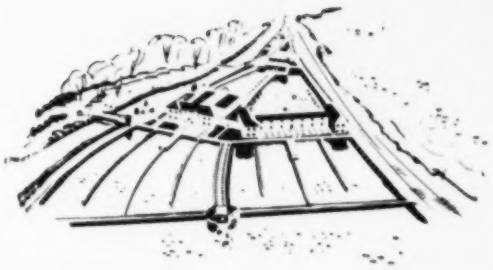
To quote from Lewiston's 1951 City Engineer's Annual Report: "(The new filters) have given the utmost satisfaction. They wash evenly and the initial loss of head is less than it was with the original construction."

Our congratulations to Lewiston on a thorough job of investigation, and a careful job of installation. We know the City will continue to be pleased with the low operating and maintenance costs of these porous-plate underdrains.

THE FULL LEWISTON STORY is described in a magazine article by W. H. Berkeley reprinted from the AWWA Journal. It tells of their experiences with graded gravel, pipe lateral bottoms, describes how they installed the porous plates, and outlines the benefits derived from the new underdrains. A copy of this article, together with a 56-page booklet on porous media, will be sent free of charge. Simply address: Dept. M-63, Refractories Div., The Carborundum Company, Perth Amboy, N. J. Both are very worth-while.

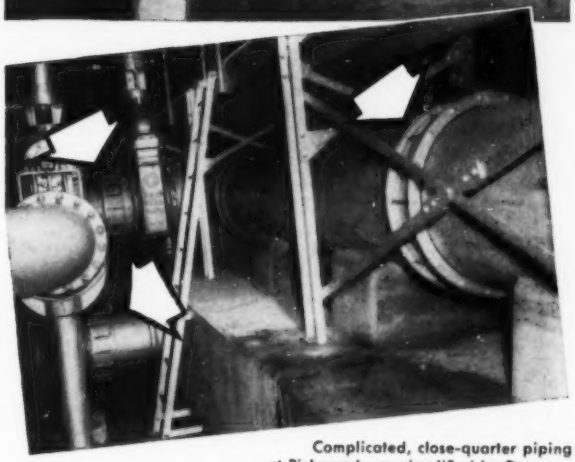
CARBORUNDUM
Registered Trade Mark





at Richmond, Virginia...

DRESSER COUPLINGS *Safeguard Big Valves*



Complicated, close-quarter piping at Richmond was simplified by Dressers. Required no exact pipe fitting, absorbed pipe movement without leakage.

Marsden C. Smith, Richmond's Chief Water Engineer, writing in *Water & Sewage Works*, says, "The design of the large valves controlling the filters in our No. 2 Purification Plant has been greatly improved by the use of 'plain ends' connected by flexible couplings. This eliminates dangerous stresses on the valve bodies, due to expansion and contraction, and also provides a simple means of replacing the valve, or its removal for repairs."

Dresser Couplings make big-pipe installations easier, faster . . . even in close, cramped quarters. Dressers can give or take as much as 3/8", deflect as much as 4° or more.

Dresser Couplings eliminate expensive maintenance . . . assure lifelong dependability.

DRESSER®

COUPLINGS

Dresser Manufacturing Division,
59 Fisher Avenue, Bradford, Pennsylvania
(One of the Dresser Industries)

FREE ENGINEERING DATA

Let us send you Dresser engineering installation reports, with facts and figures that may help you. Mail the coupon below.

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59 Fisher Ave., Bradford, Pa.

Gentlemen:

Please send me your engineering reports on recent Dresser Coupling installations.

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All Working Parts Contained in Removable Barrel... New Barrel Installed in Jiffy

- The barrel, containing all the working parts of the hydrant, is readily removed for inspection or for repair by simply unscrewing from the elbow and withdrawing from the protection case. *No excavating.*

- This exclusive Mathews feature eliminates any need for repair work on the job. A spare barrel can be inserted in a few minutes and the broken barrel repaired in the shop.

- With automobile accidents breaking an increasing number of hydrants, this speed of replacement is of tremendous importance in maintaining community fire protection.

No Other Hydrant Offers So Many Essential Features:

Compression type valve prevents flooding • Head turns 360° • Replaceable head • Nozzle sections easily changed • Nozzle sections easily raised or lowered without excavating • Protection case of "Sand-Spun" cast iron for strength, toughness, elasticity • Operating thread only part to be lubricated • All working parts contained in removable barrel • A modern barrel makes an old Mathews good as new • Available with mechanical-joint pipe connections

MATHEWS

HYDRANTS

Made by R. D. Wood Company

Public Ledger Building, Independence Square, Philadelphia 5, Pa.

Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

150th anniversary

MODERN, NUISANCE-FREE

Refuse Disposal

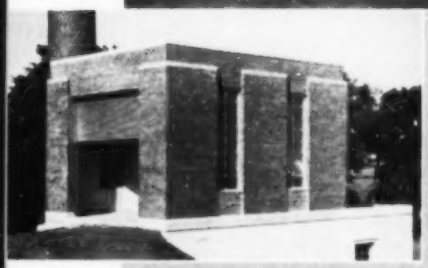
to highest community standards

GREEN BAY, WISCONSIN
Capacity 120 tons per 24 hours

PITTSBURGH • DES MOINES

High Temperature

REFUSE INCINERATORS



WILMINGTON, DELAWARE
Capacity 225 tons per 24 hours

MONROE, WISCONSIN
Capacity 30 tons per 24 hours

BURLINGTON, NORTH CAROLINA
Capacity 60 tons per 24 hours

The problems of refuse disposal at low cost and without offense to surrounding areas are answered effectively by Pittsburgh-Des Moines Incinerators. Operating at high temperatures, these efficient units burn combustible refuse completely, without odor or objectionable smoke, and are built in all capacities. Let us consult on your particular requirements, without obligation.

PITTSBURGH • DES MOINES STEEL CO.

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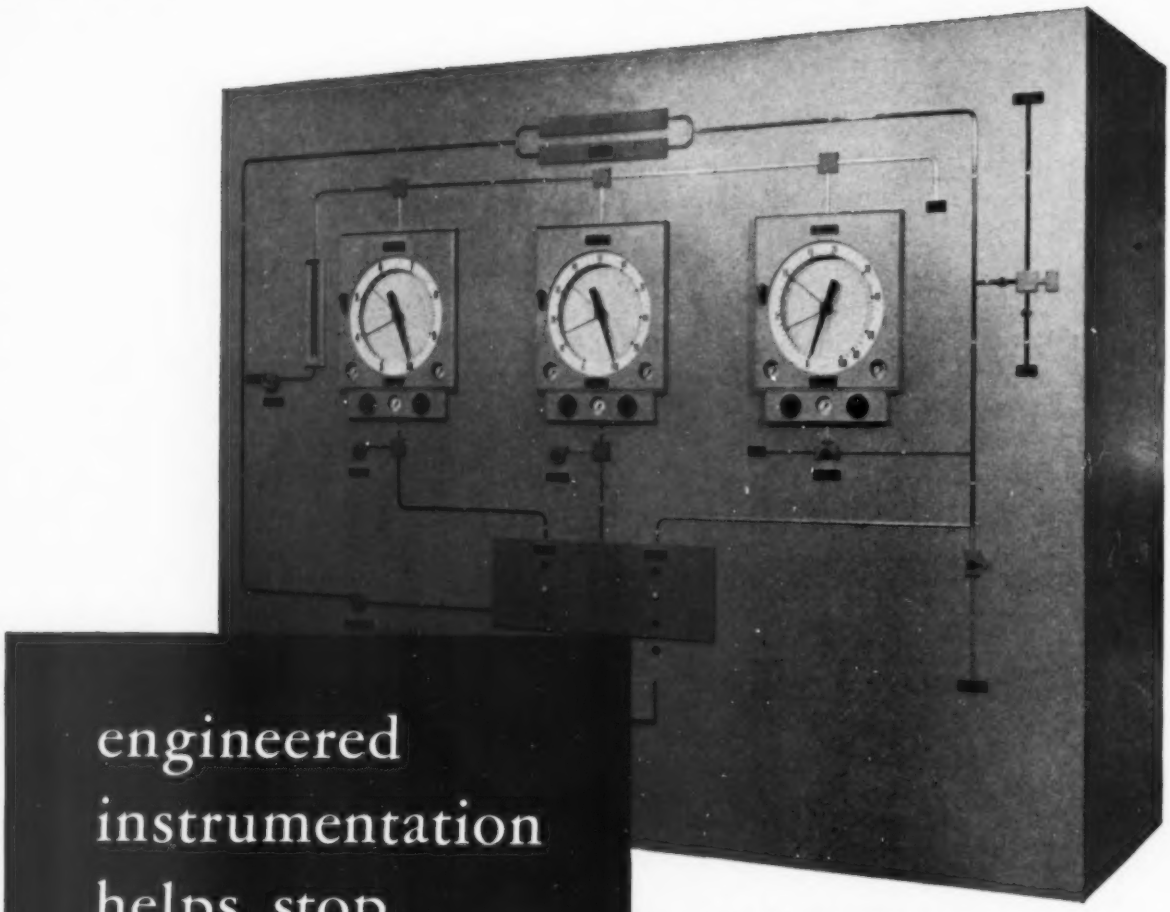
DES MOINES (8), 919 Tuttle Street
DALLAS (1), 1223 Praetorian Bldg
SEATTLE . . . . . 526 Lane Street
SANTA CLARA, CAL., 625 Alviso Road



engineered instrumentation helps stop water corrosion

30,000 gallons of water per minute are treated under the control of this instrument panel. Mounted on the graphic process diagram are ***ElectroniK*** *instruments with* ***Air-O-Line*** *control, for regulating pH, sodium dichromate concentration, and total solids.*

IMPURITIES in raw water cause a multitude of troubles. However, through the application of modern water-treating methods—controlled by Honeywell engineered instrumentation—large volumes of water for plant use can be continuously processed to reduce these deteriorating effects to a minimum.

In the panel pictured above, three *ElectroniK* instruments team up to control the treating process. One of them adjusts pH by regulating the addition of sulfuric acid. The second works in conjunction with a Beckman flow colorimeter to control the addition of sodium dichromate, the oxidation inhibitor. The third instrument regulates blow-down to maintain a specified concentration of total solids. Together they provide complete, automatic control of the water treatment . . . reduce scaling, corrosion and biological attack . . . cut costs of chemicals and labor.

An unseen but important plus value here, as in many other installations, is the Honeywell engineering behind the job . . . which combined all the required control functions into an integrated, functionally designed *Colorgrafic* control panel. This same engineering experience, and Honeywell's complete line of instruments, are ready to work with you and your consulting engineer on any water or waste treatment project.

Your local Honeywell representative will welcome the opportunity to discuss engineered control . . . and he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4575 Wayne Ave., Philadelphia 44, Pa.

● **REFERENCE DATA: Write for Catalog 1550, "Measurement and Control of pH, Redox and Conductivity."**

MINNEAPOLIS **Honeywell**

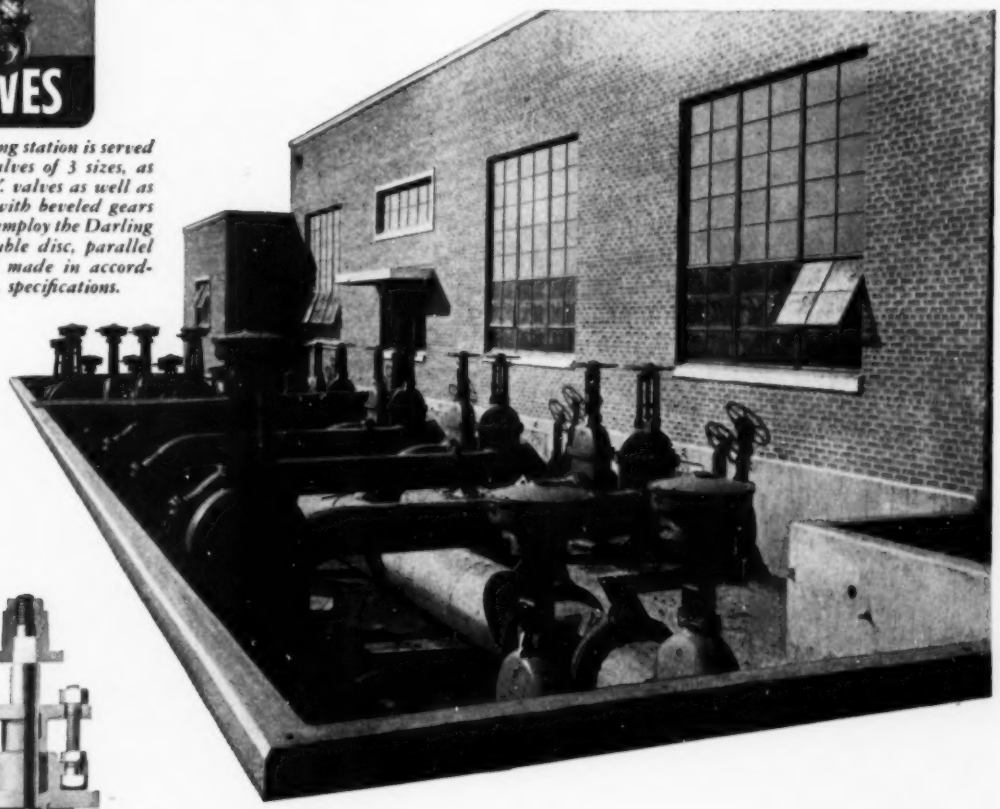
BROWN INSTRUMENTS

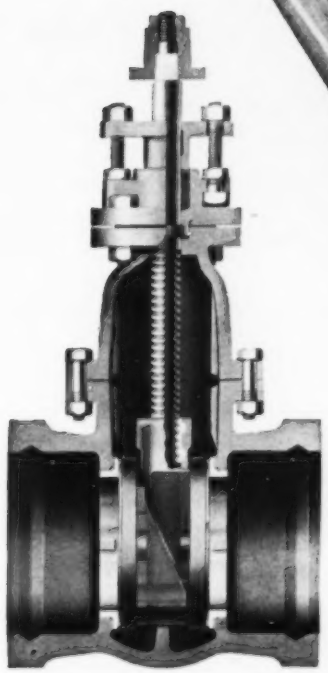
First in Controls

DARLING VALVES

FOR PLUS VALUES, JOB-PROVED AGAIN AND AGAIN

This modern pumping station is served by Darling gate valves of 3 sizes, as shown—20" O.S.&Y. valves as well as 30" and 36" sizes with beveled gears and gear cases. All employ the Darling fully revolving, double disc, parallel seat principle, and made in accordance with A.W.W.A. specifications.





Note rugged simplicity of this unique Darling principle—just four sturdy working parts . . . two plain interchangeable no-pocket discs and two husky wedges. Assembly and maintenance is extremely easy and foolproof.

Time and money ahead

THIS new municipal pumping station gains a unique advantage proved in hundreds of similar operations throughout the country. Because these gate valves are Darlings . . . *featuring Darling's fully revolving, double disc, parallel seat principle* . . . the city as well as the water department will be time and money ahead years on end.

If you haven't yet checked into Darling gate valves of this type (shown in cutaway view at left) we'd like to give you *all* the facts on the distinctive features that always add up to . . .

1. Positive, easier closing. 2. Automatic adjustment for valve body distortion. 3. Elimination of disc-to-seat galling. 4. Uniform wear distribution. 5. Greater service life with far less maintenance.

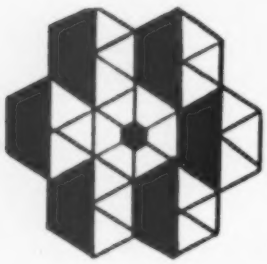
SEND FOR BULLETIN

Darling's latest bulletin is full of helpful information and describes Darling valves of *all* types for every normal or unusual service.

DARLING VALVE & MANUFACTURING CO.

Williamsport 11, Pa.

Manufactured in Canada by The Canada Valve & Hydrant Co., Ltd., Brantford 7, Ont.



Acres
OF P.F.T. FLOATING COVERS

The Southerly Sewage Treatment Plant at Cleveland, Ohio, incorporates a design that is both functional and pleasing to the eye . . . The two groups of six hexagonal digesters equipped with P. F. T. Floating Covers were installed in 1934. Hexagonal control chamber forms the center of each group . . . The City of Cleveland added a third group of six digesters with P. F. T. Floating Covers in 1951. These eighteen digesters are each 95'-0" across the short diameter and have a combined volume of 3,640,000 cu. ft. . . . In the control chamber in the battery of digesters shown in the background of the above picture, are located eight P. F. T. two-pipe heat exchangers. Utilizing waste heat from the sludge gas engines and gas fired boilers, these units preheat all of the raw sludge before addition to the eighteen digesters. In the new control chamber in the foreground are located two additional P. F. T. heat exchangers utilizing heat from gas fired boilers to balance heat losses from the new digesters which are not equipped with internal coils . . . Transmission and utilization of sludge gas without hazard is assured by P. F. T. Gas Safety Equipment throughout. Engineering for both projects by Havens & Emerson, Consulting Engineers, Cleveland, Ohio. Bulletin No. 332 discusses sewage sludge digestion and describes P. F. T. Floating Covers in detail.

P.F.T.

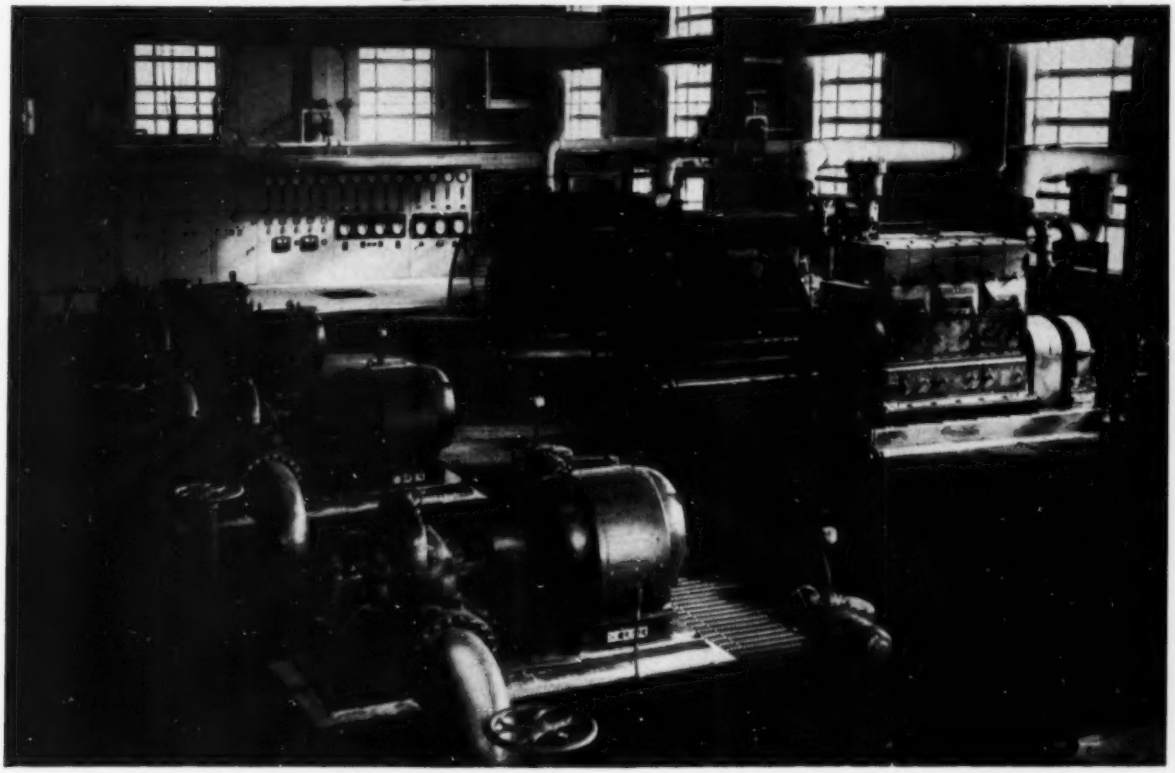
PACIFIC FLUSH TANK CO.

Waste Treatment Equipment Exclusively Since 1893

4241 RAVENSWOOD AVE. CHICAGO 13, ILLINOIS

NEW YORK • LOS ANGELES • SAN FRANCISCO • CHARLOTTE, N. C. • JACKSONVILLE • DENVER

DE LAVAL FIRE PUMPS *on the job at Idlewild*



Ten De Laval centrifugal pumps, with a total capacity of 34,000 gpm, play a vital role in the deluge fire-fighting system of the New York International Airport at Idlewild, Long Island.

The installation is composed of two 2,500 gpm and three 4,000 gpm motor-driven pumps as well as two 2,500 gpm and three 4,000 gpm diesel-driven units, which are used for standby service. When the normal operating pressure drops from 165 psi to 140 psi or less, the electric pumps go to work automatically. The diesels are brought into service as necessary.

Efficient De Laval centrifugal pumps are serving water works and fire-fighting stations all over America. These pumps are available in capacities ranging from less than one million gallons per day to more than 100 million gallons per day.

DE LAVAL *Centrifugal Pumps*

DE LAVAL STEAM TURBINE COMPANY
824 Nottingham Way, Trenton 2, New Jersey

DL 177

use Calgon* to clean water wells

People who clean water wells with Calgon report excellent results. One plant, for example, had a well capacity increase from 140 gpm to 520 gpm after cleaning with Calgon!

Calgon is harmless at all concentrations and is easy to handle. Calgon forms no toxic fumes.

If you'll write or call us, we'll be happy to tell you more about the use of Calgon for water well cleaning, and what this technique has done for others.

HAGAN
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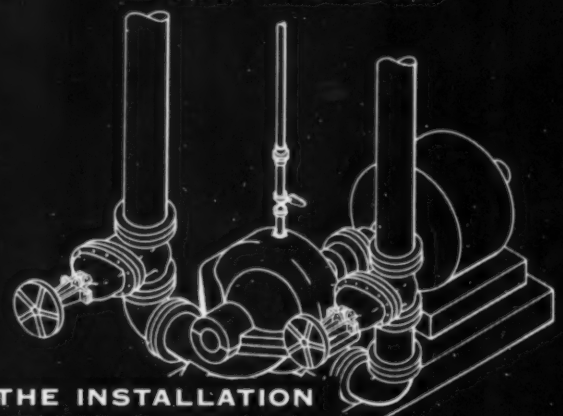
A SUBSIDIARY OF HAGAN CORPORATION
HAGAN BUILDING, PITTSBURGH 30, PA.

*T.M. Reg. U.S. Pat. Off.

Will Your Valves Last 50 Years?

...on this Tough Pump Service, for instance



THE INSTALLATION

VALVE SERVICE RATINGS

SUITABILITY: Doing the job for 50 years

MAINTENANCE COST: Routine care only

SERVICE LIFE: Installed 1903—Now on new pumps

OPERATING RESULTS: No shutdowns for valve trouble

AVAILABILITY: Catalog item—Current No. 465½

At The Great Western Sugar Company, Longmont, Colorado, plant, with Crane Iron Body Wedge Gate Valves on suction and discharge lines of juice pumps.

THE CASE HISTORY

Originally the Crane valves were installed on belt-driven pumps when the plant was built in 1903. In 1952, the old pumps were replaced. Nearly all the Crane valves were found in good condition and put right back in service on the new pumps.

It's no easy job these Crane 6 and 8-inch, 125-pound brass-trimmed gate valves have been doing since 1903. The plant operates on 80-day continuous beet sugar campaigns. In spite of intermittent operation, and with periodic routine maintenance only, the Crane valves never fail to operate freely, smoothly, and seat tightly. For 50 years they have assured dependable, positive flow control in event of pump failure—and they're still doing it.

THE VALVE

Here is today's model of these "50-year service record" Crane 125-pound iron wedge gates. Still made to the most rigid quality standards, these modern valves keep building unusual performance records in every industry. They come in patterns for every need. See your Crane Catalog or your Crane Representative.

THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

LINK-BELT sanitary engineering equipment is built to last with LINK-BELT components

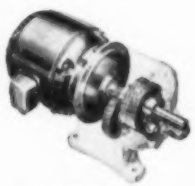
IN municipalities and industrial plants all over the country, Link-Belt water, sewage and waste treatment equipment provides reliable, efficient service. There are two important reasons for this outstanding record—

First, Link-Belt designs are based on broad experience and sound engineering . . . assure the finest in modern treatment techniques. Second, and equally important—Link-Belt equipment is built to the highest standards with Link-Belt power transmission and conveying components. This is your guarantee of long-life, high-efficiency operation.

The Link-Belt line includes coarse and fine screens, grit and sludge collectors for grit chambers and settling tanks, scum breakers for digestion tanks and sludge handling equipment. Our sanitary engineers will be glad to work with your engineers, chemists and consultants—help you get the best in modern treatment equipment. Call the Link-Belt office near you for complete information.

P.I.V. VARIABLE SPEED DRIVE

For positive, infinitely variable speed selection. Choose from 16 types, ½ to 25 hp, reduction ratios 6:1.

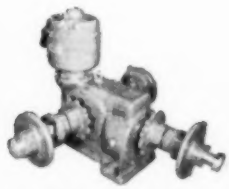


GEARMOTORS

Safe, compact, efficient. Output speeds from 6 to 280 rpm in standard line of double and triple reduction units.

ELECTROFLUID DRIVES

Hydraulic coupling combined with induction motor for smooth starting and shock load protection. Avoids "over-motoring."



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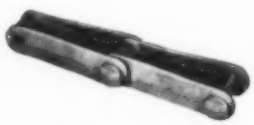

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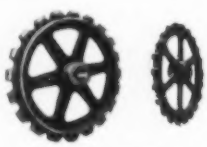

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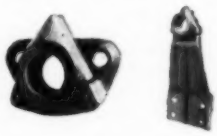

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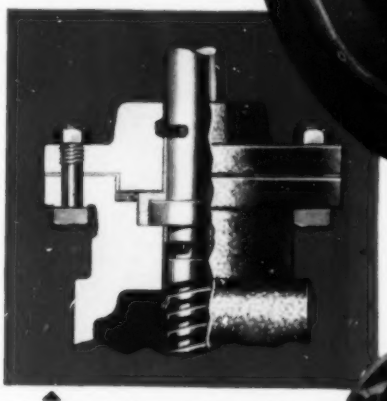

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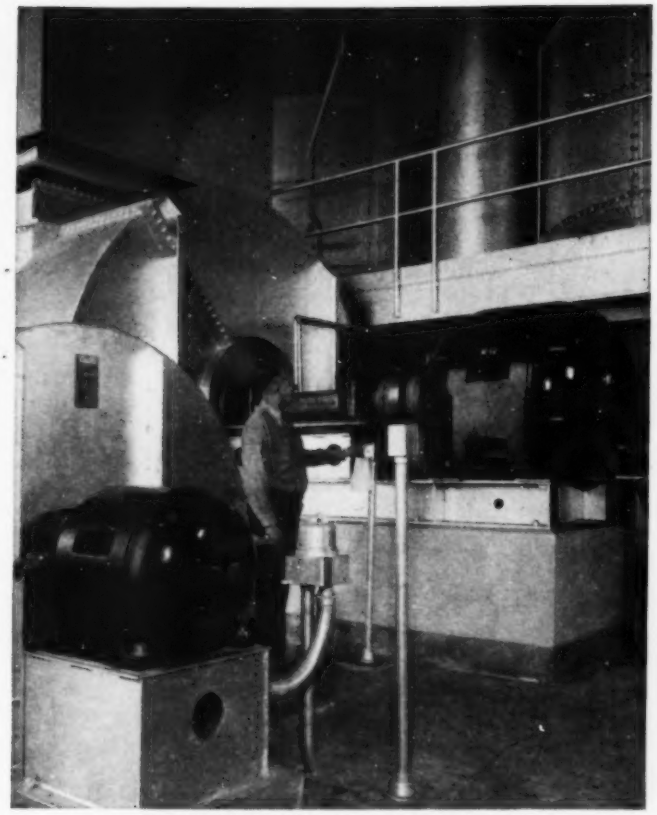
1. SAN FRANCISCO. Main control room at North Point treatment plant represents a modern trend in plant design. Completely G-E equipped, this room houses line-up of main plant switchgear and limitamp control. M. & K. Corp., Stolte, Inc., Fred J. Early, Inc., and Hass & Rothschild acted jointly as general contractors for the plant. Electrical contractors were Pacific Electrical and Mechanical Co., Inc. and Del Monte Electric Co.

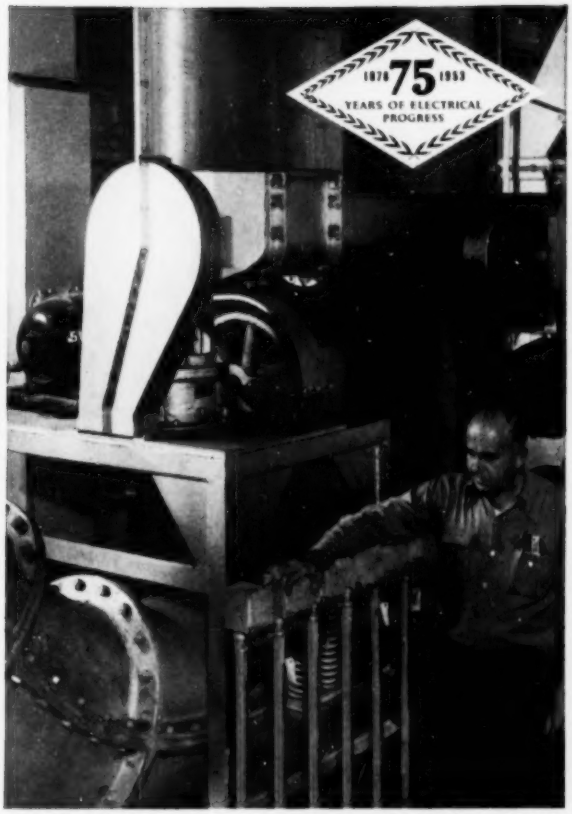
CLEAN WATERS programs

3. NEW YORK. G-E switchgear at Owls Head provides primary control and protection for motors, transformers. Plant generates most of its power from sludge-digester gas.

In main pump room at Owls Head plant, six G-E motors ranging from 450 to 700 hp drive Worthington pumps. Plymouth Electric Construction Co. was electrical contractor



2. LOS ANGELES. All motors at Hyperion plant were selected by G-E engineers to fit the application. A plant foreman starts a G-E 250-hp motor that drives a vapor fan.



G-E Tri-Clad* gear-motors provide power for intricate sludge conveyor system shown here. Motor design provides protection from physical damage, operational wear and tear.

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G-E equipment plays major role in new sewage treatment plants, helps make pollution control programs successful

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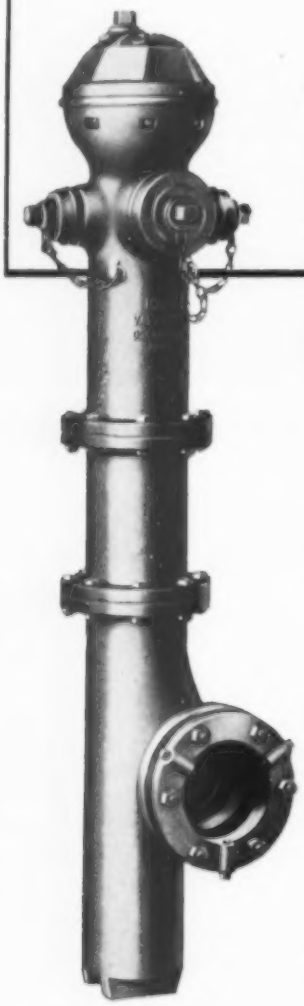

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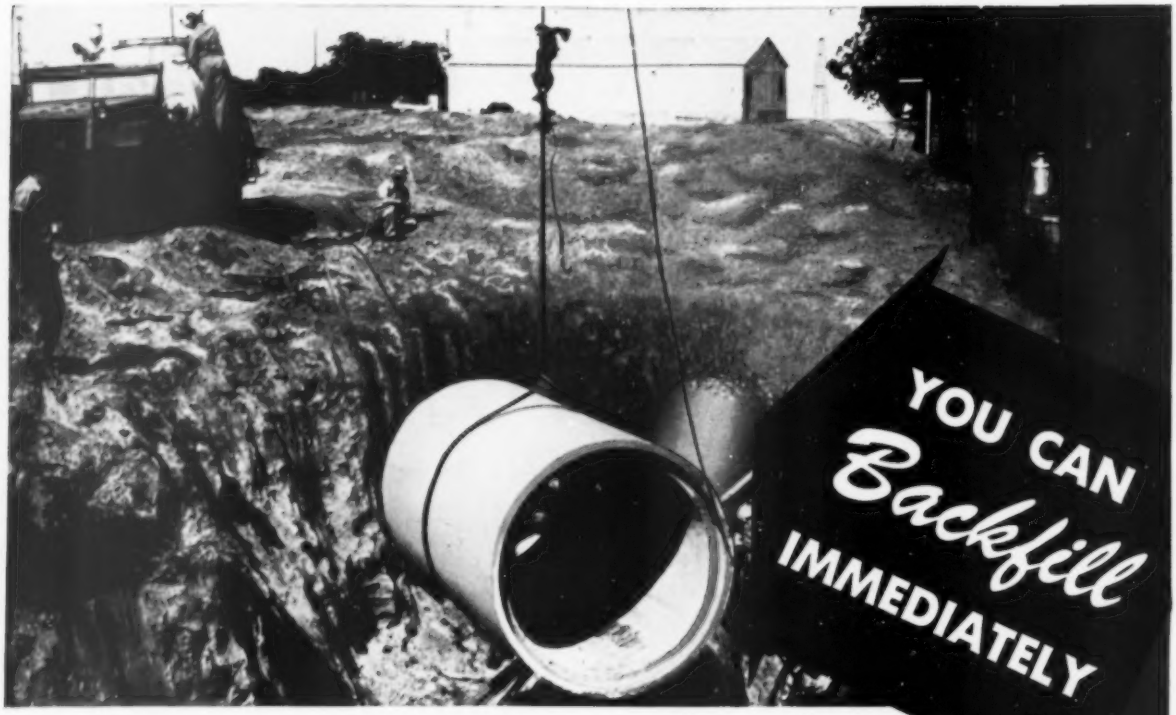

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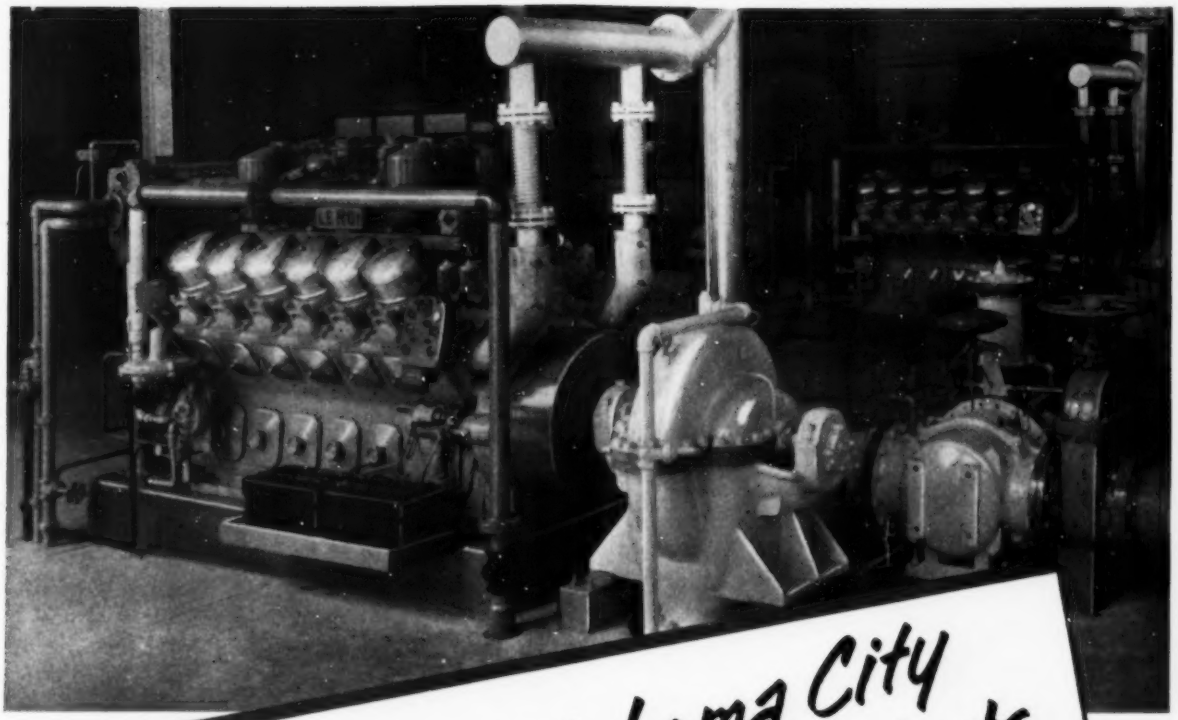

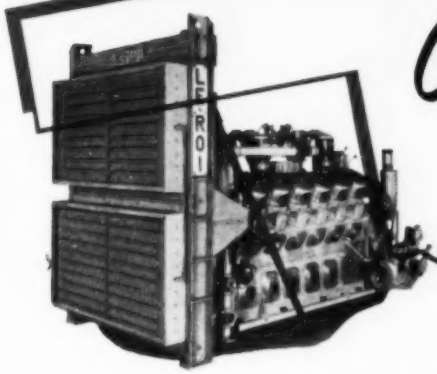

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WATER & SEWAGE WORKS

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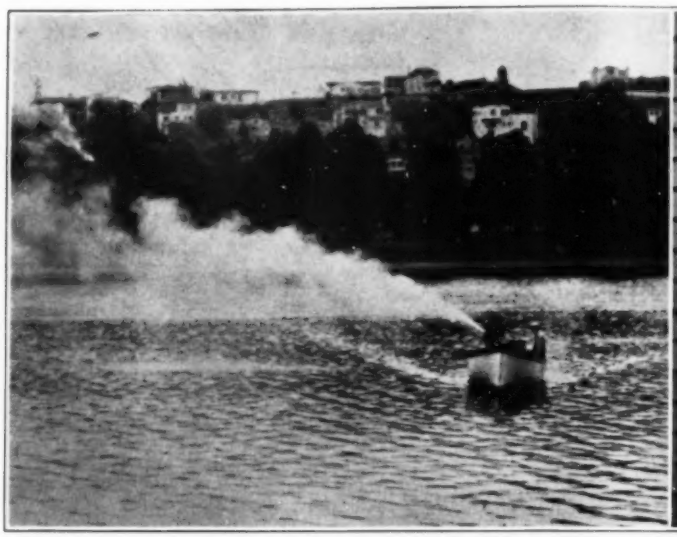


Fig. 1—TREATING a reservoir with blower broadcasting unit.

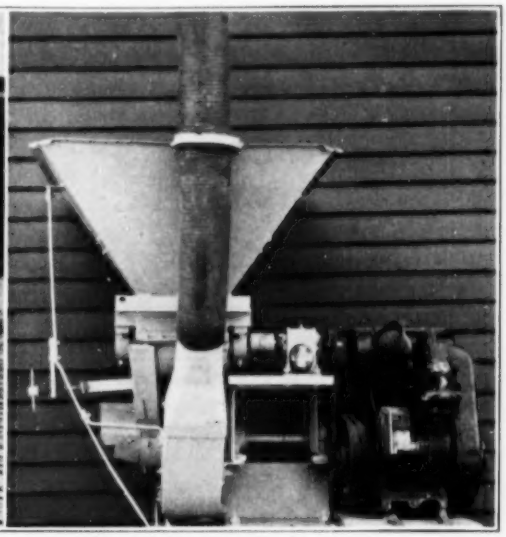


Fig. 2—Near view of the blower unit.

Reservoir Treatment by Improved Methods

Development of improved methods and apparatus by Los Angeles Department of Water

by **RAY L. DERBY**, *Principal Sanitary Engineer*
and
FRED W. TOWNSEND, *Sr. Water Treatment Operator*
Department of Water and Power, Los Angeles, Calif.

THE use of open storage reservoirs in a water supply system often produces problems in maintaining satisfactory water quality. Standards suffer because of biological, chemical, and physical changes which develop in the reservoir. The control of reservoir problems has produced numerous methods of reservoir treatment. Each method has usually been adaptable to a variety of applications, but not necessarily adaptable to all problems met with in providing effective reservoir treatment.

The Department of Water and Power of the City of Los Angeles has 26 open reservoirs with a total capacity of about 400,000 acre feet. These reservoirs range in individual capacity from 9.4 to 183,500 acre feet, with areas from a few acres to 3,000 acres. They are located over a widely scattered area at distances up to 350 miles from Los Angeles and at elevations varying from 378 to 7,130 feet above sea level.

The Authors

Ray L. Derby F. W. Townsend

With such an extensive system a wide range of conditions is encountered, producing a variety of reservoir problems. The conventional methods of reservoir treatment such as controlling algae growth by dragging sacks of copper sulfate behind a boat, or using one of the several solution type methods, are too slow for the large treatments used by the Los Angeles Department. To meet existing conditions, three general types of equipment have been developed for use in the treatment of the Los Angeles Reservoirs. An original method of treating with copper sulfate by scattering the pulverized chemical over the surface of the reservoir with a blower was developed which was effectively used for some time. Due to certain objectionable characteristics of the blower system, a belt conveyor machine was produced which has replaced the blower units for certain

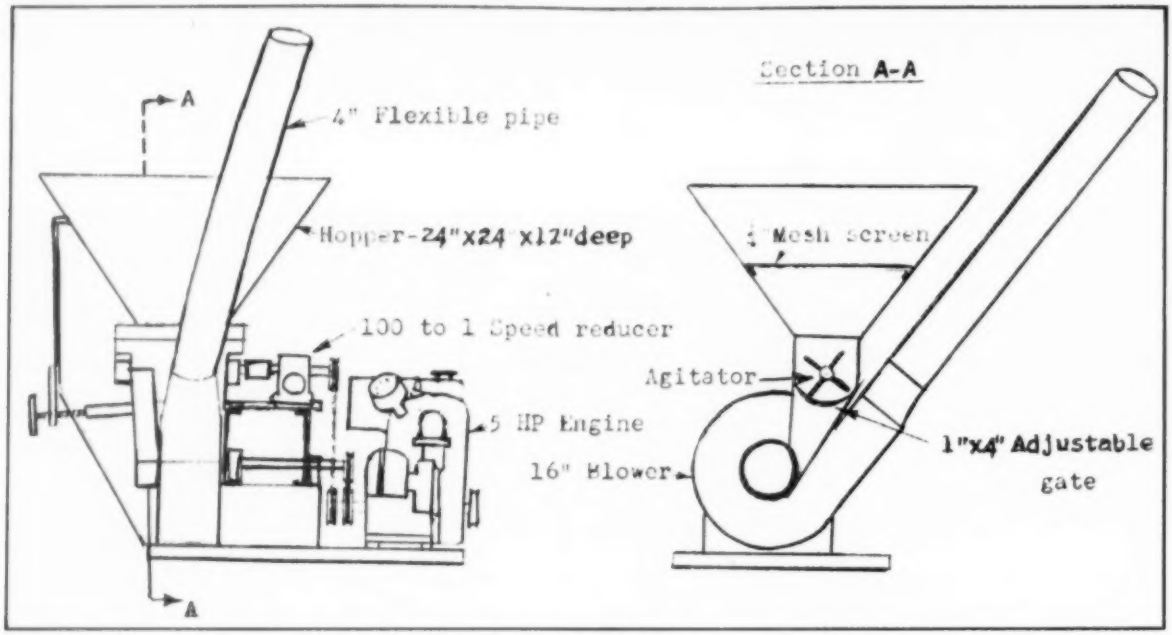


Fig. 3—SPECIFICATION sketch for blower type chemical broadcaster.

jobs. In addition to these machines, a continuous solution feed unit has been developed for specific problems.

Methods of Applying Copper Treatment

Blower Type Distributor

The blower type copper sulfate distributor (Figs. 1-2-3) has been used successfully for many years for both surface and depth treatments, but its use is now limited to the treatment of growths that develop in the *top* levels of the reservoirs and succumb to small doses of copper sulfate. It is conveniently portable, compact enough to fit into large row boats as well as power boats, and sturdy enough to withstand the beating of a high speed blower and gasoline engine. The blower operates from 3,000 to 3,500 r.p.m. which has a tendency to grind copper sulfate snow into smaller particles. These small particles are blown into the air, and wind currents assist in spreading them over the surface of the water, as may be observed in Fig. 1.

The operator is dependent to a certain degree upon prevailing weather conditions, and also upon the speed and capacity of the boat available for use. The calm, nearly perfect, day is far from ideal for the water treatment operator. It means a much lighter feed of copper sulfate and much closer treatment lanes which requires a considerably longer time to cover the given area. Optimum weather conditions consist of light winds of 10 to 15 m.p.h. blowing steadily from some one direction. This permits a higher rate of copper sulfate feed, and a marked increase in the width of the treatment lanes thus decreasing the total time of treatment considerably. Haiwee Reservoir with an area of 1,804 acres can be treated under favorable conditions in 4½ to 5 hours with 5 tons of copper sulfate. On a calm day treatment would require from 10 to 12 hours for completion. Reservoir treatments should be completed in one continuous operation. A lay-off of even a few hours may result in the shifting of water to such an extent that some areas may be under-treated, with a resulting decrease in effectiveness of treatment—or, may be over-treated, with resulting hazards to fish life.

The principal advantage of the blower type machine is the ability to rapidly treat large surface areas with a light dosing of copper sulfate. Another advantage is the breaking down of the copper sulfate crystals in the blower to a fine dust. This allows the smaller particles to spread more evenly over the surface of the water and dissolve more rapidly upon com-

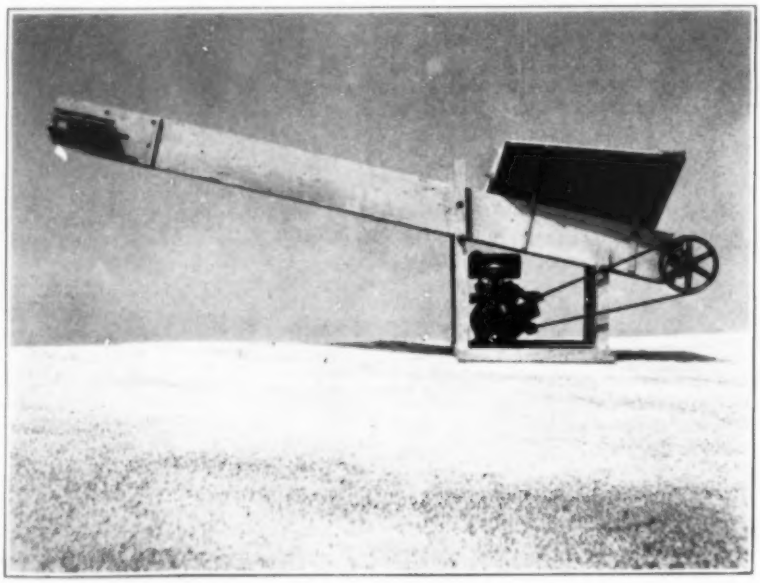


Fig. 4—TREATING reservoir with belt-conveyor type chemical distributor.

ing in contact with the reservoir surface. Certain disadvantages are found in the blower type machines. The larger machines are heavy enough to reduce the permissive load of chemical in the boat and two or more men are required to handle the units in and out of the boat. They need continual adjustment by a trained operator to maintain a constant feed and to obtain an even distribution of copper. An excessive rate of feed may clog the discharge spout. Their use is dependent upon the wind for distribution of copper sulfate, and with shifting winds the boat crew as well as the reservoir may be dusted with copper sulfate. There is always the loss of varying amounts of copper sulfate dust that is carried away by the wind and settles upon the above water shore line of the reservoir.

The blower type machines are of various sizes and weights, but basically they are all of the same construction pattern (Fig. 3): (1) A hopper with sloping sides holding 130 to 170 pounds of copper sulfate; (2) an agitator just above the bottom of the hopper having a speed of from 15 to 30 r.p.m.; (3) an adjustable orifice to feed from 5 to 60 pounds per minute; (4) gas engines, 2½ to 6 h.p. at 3,500 r.p.m.; (5) 14″ to 16″ blowers directly connected or V belt driven with copper sulfate fed directly into the suction port and 4″ to 7″ outlet spout for dispersion; (6) a light frame to support counter shafts and hopper speed reducer. The total weight of the unit will vary from 250 pounds to 450 pounds depending upon the size and type of material used. The cost will vary from $250.00 for the smallest size to $800.00 for the largest size.

Fig. 5—LATE MODEL of belt-conveyor type feeder.

Belt Conveyor Distributor

The belt conveyor machine (Figs. 4-5-6) has a number of advantages over the blower type machine. It allows the operator a very wide range in the feed of the chemical used. The range is from 1.2 pounds to 200 pounds per minute by a minor adjustment of the feed slot only. It is a light machine of approximately 120 pounds in weight and is in two sections, making it possible for one operator to transfer the machine from a truck to a boat if required. The belt conveyor feed operates very evenly. It drops the chemical into the propeller wash of the boat (Fig. 5) and the distribution of the chemical is not wholly dependent on weather conditions. The hopper is very low, 28″ from the boat deck, which means a minimum of effort required to fill the hopper with the chemical. The belt conveyor trough is adjustable in height, and will fit the stern of practically any boat. This machine, after the initial adjustment of chemical feed, requires very little attention from the water treatment operator. This allows the operator more time for directing the boat operations to get the required distance between boat lanes and full coverage of the reservoir.

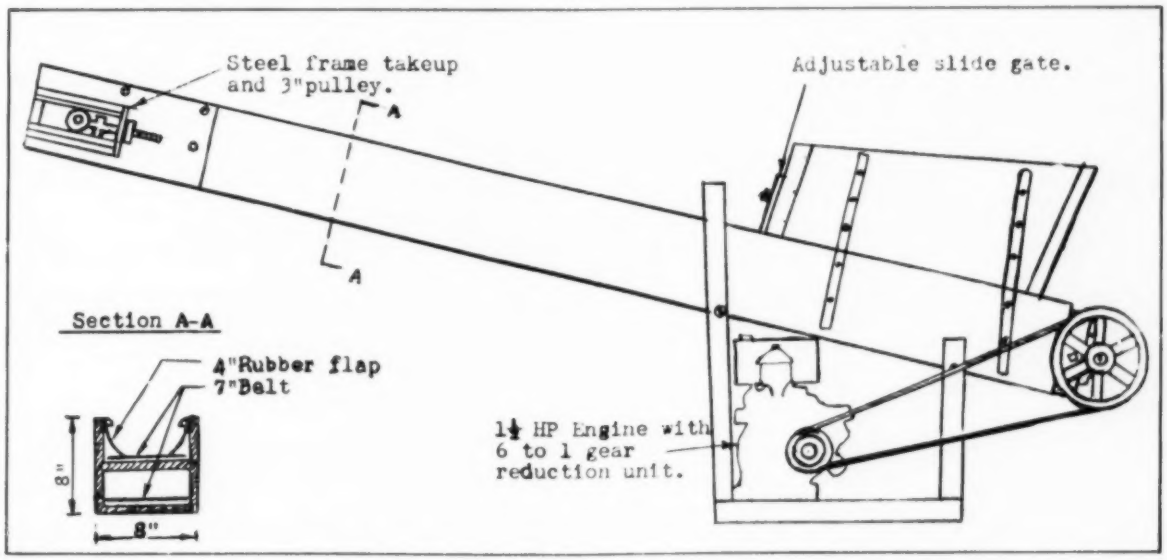


Fig. 6—SPECIFICATION sketch for belt-conveyor type chemical feeder.

Fig. 7—TYPICAL continuous copper sulfate solution feed tank.

The belt conveyor machine was originated and constructed with a dual purpose in mind. First objective was a better, faster and cleaner method of applying large doses of copper sulfate. Second objective was a method of applying powdered alum to reservoirs for the coagulation and precipitation of silt brought in by winter flood waters.

Two machines of this type have been constructed and have been used in the treatment of a number of reservoirs with copper sulfate. The first treatment with a machine of this type was made at Lower Hollywood Reservoir on October 3, 1952, when 5,600 pounds of copper sulfate were applied over an area of 120 acres in 2 hours time. A complete survey of the reservoir was made two hours after the completion of the treatment. The copper was found to be evenly distributed over the entire surface and at comparative depths was found to be evenly distributed throughout the entire body of water. The treatment was successful in every respect. It is interesting to note that this treatment was made on a calm day; the type of day that in the past made treatments slow and distribution very poor when using the blower machine.

The largest treatment was made with the two machines at Haiwee Reservoir on February 4, 1953. Once again the weather was calm. The treatment, involving 46,000 pounds of copper sulfate was completed in 8½ hours. A survey of copper residuals once more showed a good distribution, and results of the treatment were satisfactory.

One of the apparent advantages in the use of the belt conveyor is that there is no breaking down of the copper sulfate snow in its application. This allows the larger snow crystals to penetrate to a greater depth before dissolving, which is beneficial in helping control the deeper winter growths. It is believed that this method of the application of copper sulfate could be adapted to the treatment of top level summer growths as well. A lighter feed of the copper sulfate snow and a better screening for more fines and dust promises to be a satisfactory solution to the problem.

Experiences With Alum Feeding

The second purpose of the machine was to find something that would apply powdered alum to an open reservoir in a uniform manner. The blower type machine proved to be poorly adaptable to powdered alum feeding, due to the powder packing in the machine and also due to excessive dusting during operation. The conveyor belt machines (test runs only) have apparently solved these problems. They have given a uniform feed; and with the propeller of the boat acting as the mixer, they have given a satisfactory floc and a good distribution. Up to the present time there has been no opportunity to test this equipment while using alum on a large scale operation.

Improved Conveyor Belt Distributor

The first conveyor belt machine built as an experiment was constructed of available parts on hand. When the second machine of this type was constructed (Figs. 4-6) a few changes and mechanical improvements were made. The original machine had a 5 inch wide flat belt traveling at the rate of 2.9 feet per second at an engine speed of 2,400 r.p.m. and using a pulley system for speed reduction. The newer machine has a 7 inch wide flat belt travelling at the rate of 2.1 feet per second at an engine speed of 2,400 r.p.m. but with speed reduction secured through a gear reduction unit attached to the motor. The slower belt speed causes less dusting, but this is a minor factor. The wider belt could be used to increase the rate of feed by changing the belt speed to that of the original machine.

The following is a list of parts used in the construction of the latest belt conveyor type machine (Figs. 4-6): a Continental 1½ h.p. engine with a 6-1 gear reduction; a 3″ dia. ¾″ bore "A" sheave pulley; a 9″ dia. ¾″ bore "A" sheave pulley; a V-belt of the "A" type of required length; a ¾″ bore 3″ by 7″ flat belt pulley on a ¾″ shaft; two ¾″ Dodge type bearings; an 18′ long 7″ rubberized flat belt; a 15/16″ bore 3″ by 7″ flat belt pulley on 15/16″ shaft; two L.B. steel frame take-ups Style A.S.; an 8″ by 8″ trough with hopper (170 pounds capacity) attached; a hardwood stand to hold engine and to support trough, constructed of 2″ finished oak. The cost of material for this machine was approximately $160.00. The total weight of the machine is approximately 120 pounds. Since the machine is constructed in two sections consisting of the hopper and belt trough as one part and the stand and motor as the other part, the machine can be readily dismantled for transportation and ease of handling.

Prior to 1949, considerable trouble had been encountered with growths of Potomogeton panormitanus and Zannichellia palustrus, commonly called pondweed or duckgrass, in certain Los Angeles City Reservoirs. Attempts were made to remove these growths using mechanical devices of

all kinds, none of which proved successful.

Control of Pondweed and Duckgrass With Copper Sulfate

After some experimental work a solution feed device was developed which successfully controls pondweed by maintaining a constant copper residual in the reservoir. At the present time four units of this type (Fig. 7-8-9) have been installed and are used whenever the necessity arises. These units, ranging in capacity from 1,200 to 15,000 pounds, are of sufficient size to hold a minimum of a five day supply of large copper sulfate crystals. This allows the operator to visit the installation on a semi-weekly basis. The solution feed units consist of a redwood storage tank (Figs. 7-8) and a water supply tank. On opposite sides of the redwood tank 4" by 6" screenboxes are constructed extending the full depth of the tank. The lower section of each box is perforated with a number of ¼" diameter holes. These are large enough to allow the free flow of inlet water and outlet solution but will restrict the large copper sulfate crystals (1" by ½") from clogging the inlet and outlet lines. The water supply is furnished by a constant level tank, and the flow is regulated by an adjustable outlet. All pipe fittings on the copper sulfate solution side are of hard rubber or plastic. The water level in the bottom of the redwood tank is maintained at a depth of about 12". The rate of feed is determined by the flow of water from the adjustable head box through the tank, and the concentration of the copper sulfate in the saturated or nearly saturated solution is dependent upon the temperature of the water. A few difficulties have been encountered. Metal fittings and hoops on the tanks need occasional replacements. A copper carbonate deposit tends to clog the outlet line, and an additional water supply stream is required to keep the line flushed and to reduce the periodic cleanings necessary. Impurities in the copper sulfate leave a deposit in the bottom of the tanks and necessitate seasonal cleanings. It has been found necessary to use nothing less than ¼" to ½" crystals to allow a free flow of water through the copper sulfate itself. In general, however, the units have operated efficiently with a minimum of maintenance.

The continuous feed of copper sulfate for the control of duckgrass of the type encountered has given very good results. It has been found best to start the treatment early in the life cycle when the plants are 2 to 4 inches long. At the Dry Canyon Reservoir installation (Fig. 9) this usually means starting the treatment early in March. A dose of copper sulfate sufficient to maintain a residual of 1 ppm (copper sulfate) at the outlet is fed into the inlet until the latter part of June. The residual is then cut to 0.8 ppm and maintained as such until the middle of August. Another cut is then made to 0.6 ppm and maintained as such until the end of the growing cycle. In the past three years the continuous feed has been terminated by November 1st. This treatment has controlled the duckgrass effectively, and the copper residual has been carried through the chain of reservoirs in effective, although diminishing, amounts. The retention period in this chain of reservoirs necessitates the setting up of auxiliary units on some city reservoirs to hold up the residuals in the early season until such a time as the treated water from the outlying installation can take over. In one particular case this period has been approximately 80 days.

Multiple benefits have been derived from the continuous solution feed of copper sulfate. The duckgrass has been controlled, and all but eliminated from the system where copper residuals were maintained. Periodic reservoir treatments with copper sulfate for algae control have been eliminated in those reservoirs in which copper residual is maintained in the water. The number of waterfowl has also been reduced due to the decrease in food supply.

At the present time growths that

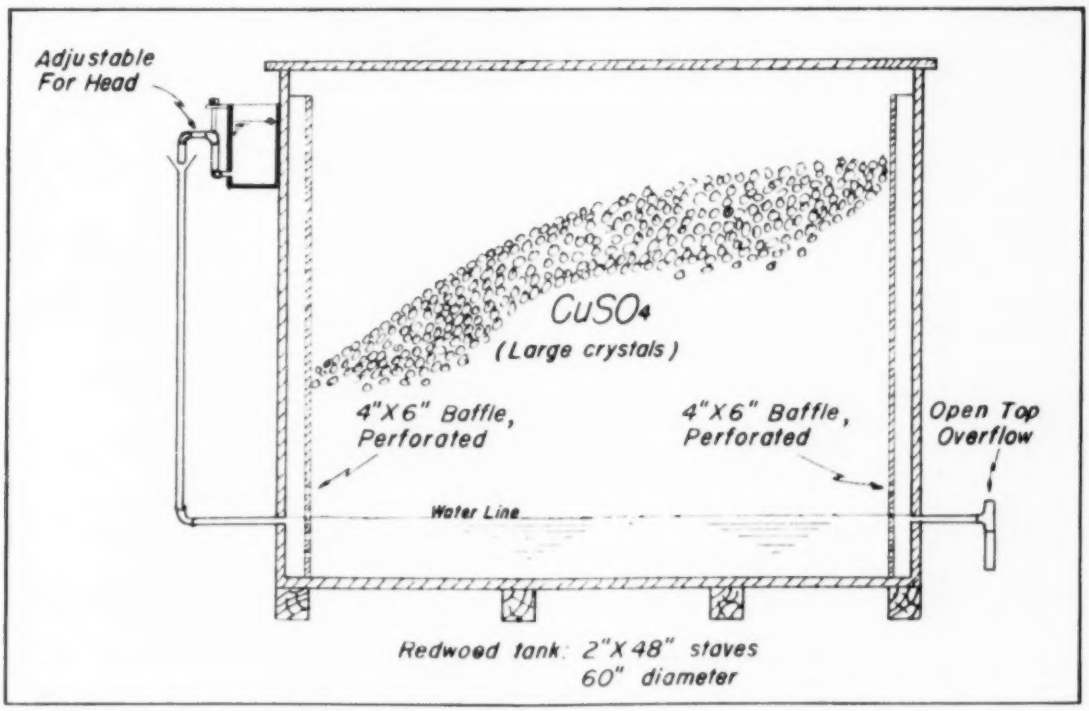


Fig. 8—SPECIFICATION sketch for continuous copper sulfate solution feed tank.

Fig. 9—CONTINUOUS copper sulfate solution feed installation for Dry Canyon Reservoir, Los Angeles Dep't. of Water & Power.

were susceptible to copper sulfate have remained so, and no new copper resistant variants have developed. A great improvement has been apparent in taste and odors throughout the system, possibly because of the reduction of the organic load which in the past years has been contributed by duckgrass and algae growths. A more palatable water has resulted as shown by a marked reduction in consumer complaints.

"Bob" Bardwell Retires

After 43 Years in Water Supply

Robert C. Bardwell, for many years superintendent of water supply for the Chesapeake & Ohio Railway System has recently retired.

After graduation in chemical engineering from the University of Illinois (1909), "Bob" accepted a position as chemist with the Missouri Pacific Railway and advanced to the position of Engineer of Water Service. In 1923 he transferred to the C. & O. Railway as Supt. of Water Supply, which position he held up to his retirement on Feb. 1 of this year, representing a 30 year service to the C. & O. System which grew tremendously during this period.

"Bob" Bardwell made many improvements in railway water supply practices and was amongst the earliest to recognize the value of "Calgon" as a suppressor of hardness encrustation in hot water lines. He has been a contributor of many technical articles, including those which have appeared in issues of this magazine. He has made special water supply surveys for nine other railroads and was known as an authority in his chosen field. He was a member of the American Institute of Chemical Engineers, and a life member of the American Water Works Association in which he was especially active.

Mr. and Mrs. Bardwell are making their home in Mt. Dora, Fla.

Philip A. Potter Joins Buck, Seifert and Jost

Philip A. Potter, for the past 16 years senior engineer in charge of water supply and sewerage for the New Jersey Board of Public Utility Commissioners, has rejoined the staff of Buck, Seifert and Jost, consulting engineers, as an associate. He originally went with the water supply and sewage disposal consulting organization when it was initiated by the late Nicholas S. Hill, Jr., and was on the staff for about 15 years.

A graduate of Massachusetts Institute of Technology, Mr. Potter has a wide experience in the construction of pumping plants and transmission lines. He is a life member of the A.S.M.E., a member of the A.W.W.A., and of the National Society of Professional Engineers. He is a licensed civil and mechanical engineer in New Jersey and a licensed professional engineer in New York.

"And, Mr. Smith, you said after cleaning those roots from our drain that you didn't think we'd be bothered again soon!"

Postcard Billing
For Water and Sewage Utilities

Some considerations which must be given when evaluating and choosing the overall best system for local requirements.

by **DALE L. MAFFITT,*** ***Genl. Mgr., Des Moines Water Works, Des Moines, Iowa***

*Vice-Pres., Am. Water Works Assn.

INCREASED efficiency in the operation of a water plant is always to be desired. This is applicable to office procedures, as well as to engineering and mechanical functions.

When we were confronted with the project of postcard billing, we had many problems that had to be resolved.

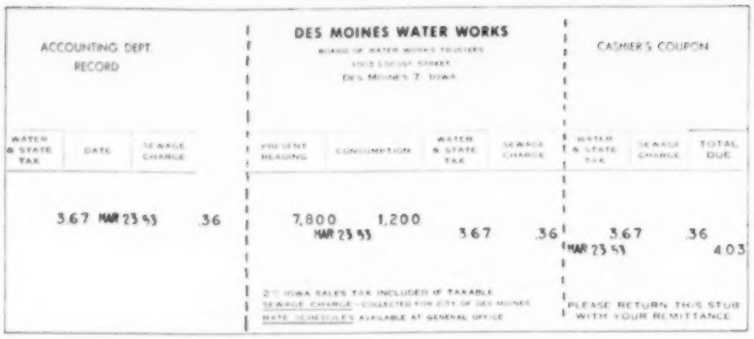
Growth of the city and the expansion of residential districts necessitated redistricting into areas of somewhat uniform size to facilitate cycle billing. The number of accounts had increased more in some districts than in others, and it was desirable to equalize them as much as possible. Furthermore, machine limitations required the changing of water customer account numbers. This project was necessary, regardless of any change in method of billing, but was one which had to be completed before *any* new system could be put into operation.

Sewer Service Billing An Additional Consideration

In 1940 the City of Des Moines started the operation of a sewage treatment works, and it became the duty of the General Manager of the water works to also become the collection agent of sewer service charges for the City of Des Moines. The law is explicit in reciting that accounts of the water department shall be kept separate and distinct from any other accounts. This necessitated the keeping of separate consumer accounts for sewer service charges and payments. Any change in method of billing would, therefore, have to prove practical in lending itself to this separation of records without complications.

GENERAL VIEW Des Moines Water Works Office, showing three cashier's accounting machines (left) and customer's lobby on far left. These machines receipt postcard bills returned to customers and show daily collection totals for water, and sewer services separately. Billing Machine Department is beyond glass partition in rear. All ledger-cards are in ready reach in files seen beyond cashier's desks.

The well known ledger-card system of recording meter readings, service connections, water charges, payments, etc., had been in use in Des Moines for many years, and we felt that this method of accounting was very good in view of the service that can be rendered to consumers and to ourselves when questions arise regarding charges, location of underground connections, etc. We, therefore, did not wish to depart from it.



POSTCARD bill, showing charges for water and sewer service separately and total due. The card size is 7¾"x3⅜ inches.
Note that a State Sales Tax is charged on all water bills.

Considerations in Choosing Proper System are Several

When it seemed feasible to change our method of billing, we contacted the companies that make modern billing machine equipment and asked each to propose a machine that would meet our specifications regarding the continued use of the ledger card system, and in such a manner that the water and sewage accounts might be kept separate and distinct.

In setting forth the specifications it was necessary to determine the kind and scope of service to be offered and maintained for the consumers, as well as the type of record most desirable for management, from the standpoint of internal control and accountability. Volume of operation was also an important factor. In addition to monthly billing of the larger customers, we have, at this time, upwards of 51,000 accounts which are billed each three months. Certain procedures and equipment which depend on a considerable volume for efficiency did not appear to be feasible in our case.

We felt it necessary to select machines that can tabulate the two basic rates in force—inside and outside the city—with proper distribution within each rate structure. This information will then be immediately available for any future rate study.

Flexibility to meet the needs created by a growing community is of prime importance. A steady growth in customer accounts must be handled efficiently, without sacrificing any services rendered. Likewise, the machine must provide for ready adjustment in case of change in water or sewage rates.

BILLING MACHINES, one of the four being now equipped to handle posting of paid accounts.
By merely changing certain bars on the posting unit it converts to a billing machine. An example of importance of selecting billing equipment possessing flexibility.

DES MOINES WATER WORKS
BOARD OF WATER WORKS TRUSTEES
1003 LOCUST STREET
DES MOINES 7, IOWA
RETURN POSTAGE GUARANTEED
JOHN R. DOE
4508 SUNSET BLVD.,
CITY. 37
JOHN R. DOE
4508 SUNSET
CITY. 37

POSTCARD bill showing address side, with identification on Accounting Dept's. and Cashier's coupons, left and right.

These cards are printed, cut, and addressed in the Addressograph-Printer.

Our ledger card system, with route and account number, designates a location; and the entire history of this service is recorded on this card. Changes in meters and in customer's names necessitate typing; accordingly, our billing machines are equipped with electric typewriters to facilitate this work by allowing the machine operator to make all necessary changes with the minimum of lost motions or time.

We felt that it would be proper to solicit the advice of certified public accountants, who reviewed with us the various types of equipment being considered. Based on their concurrence and final recommendation we selected the type of "I.B.M." machines for our postcard billing installation now in successful use.

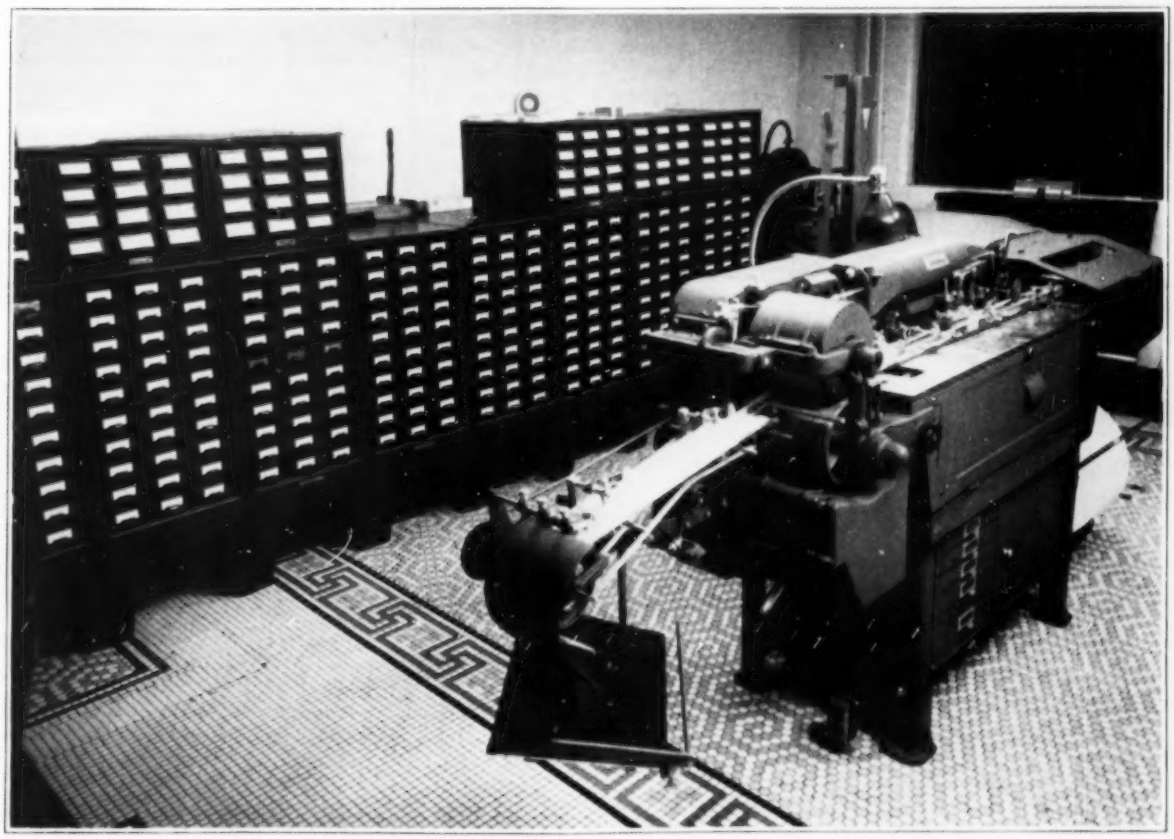
In connection with this changeover we are now using an addressograph and printing apparatus with which in one operation we print and address our own postcard bills, as compared with the expense and effort of having the bill forms printed outside of the office.

Advantage of Postcard Billing

There were several reasons why we desired to go to a postcard billing method, a few of which are here suggested.

First, the type of bill that is now produced (see cuts) gives the amount of the water bill plus the tax, plus the amount of the sewer service charge, all added together as a total. These, however, are separated into water accounts and sewer service accounts in the billing machine, as well as in the cashier's machine. Under the former system the two charges had to be added at the time of payment. We felt that this type of bill would be easy for the customer to decipher and would not detract any from our proper accounting procedures. We think that there is definite merit in keeping the accounts, namely: water and sewer service, separate and distinct in order that the customer may see plainly just what his water bill is and also the amount of his sewer service charge.

Second, prior to the postcard bill-



ADDRESSOGRAPH and printer which prints and addresses post-card bills in one operation.

Address plates are stored in cabinets on left.

LOCATION 4508 SUNSET BLVD NAME JOHN & DOE ACCOUNT NO 103-267
LOT ACRE BLOCK PERMIT NO 48323 PLAT 44 E OF PLUG ROUTE NO
TRANSFERRED FROM 103-267 APPLICATION NO 53270 W NOTATIONS S ½ OF CU:B

ACCOUNT NO 267
ROUTE NO 103
SEWAGE TREATMENT WORKS
LOCATION

ACCT NO	DATE	PRESENT READING CU FT	CONSUMPTION	APPLICATION OF RATES: AMOUNT WATER	RATE	CHARGES	TOTAL WATER CHGS	IOWA ST TAX	AMOUNT DUE	PAYMENTS: DATE	CASH & ALL	SEWAGE CHARGE	PAYMENTS: CASH & ALL	DATE
	12-28-49	S/B TRID	208700											
	12-23-52	6600												
267	MAR 25 53	7,800	1,200	1,200	m	3.60	3.60	.07	3.67	APR 9 53	3.67	.36	.36	APR 9 53
267	APR 24 53	8,900	1,100	1,100	m	3.30	3.30	.07	3.37			.33		

DES MOINES WATER WORKS

LEDGER-CARD showing complete customer billing and payment record—water, sewer and sales-tax charges separately and totallized.
These cards are of 9½ x 12 inch size, buff colored, and printed the same on both sides.

ing we made two bills, one a water bill and the other a sewage bill, both sent in an envelope with a three-cent postage charge. The postcard billing saves, at this time, one cent per bill.

Third, we appreciate the opportunity of making a saving in labor in this over-all operation.

Before the new billing equipment could be put into operation it was necessary to design new records, such as ledger cards, bills, abstract sheets, and control account forms.

The transferring of ledger account information from the old to the new records entailed the employment of temporary clerical help and required detailed cross checking to eliminate all possible error.

Sufficient preliminary work was completed by the time the new equipment was delivered to permit the training of operators in billing on the new machines to start immediately and to continue without interruption.

After the new billing routine becomes sufficiently established it is planned that a time and motion study be made to determine what percentage of the cost of making the postcard bill is allocable to water-account billing and what percentage to sewer service account billing.

Customer Reactions

The general reaction that we are getting from customers on this postcard system is favorable, and we feel that it is another step in modernizing our system of accounting.

Any water works administrator interested in making a change in method of billing accounts should contact the companies who make this modern type of equipment and have a survey made as to whether or not any change would be beneficial to both the customer and the water department as far as service is concerned, and as far as economies to the water department are involved. The latter, of course, will in proper time inure to the benefit of the water users.

Johnson Resigns as Gen. Mgr. of Buffalo Sewer Authority

John W. Johnson, Gen. Mgr., Buffalo (N.Y.) Sewer Authority, has resigned to enter private business as Vice President and General Manager of Brunner Asphalt Co., where he will have charge of the paving and contracting business and plant operation of that firm.

Mr. Johnson, who is a past president of the N. Y. Sewage and Ind. Waste Assn., and who has been active in the Western N. Y. Chapter of the N. Y. Soc. of Prof. Engrs., joined the Sewer Authority Staff in 1936 as a project engineer during the construction period. When the sewage works went into operation, Johnson became Asst. Works Supt. in 1938. In 1942, he was appointed Works Supt. to fill the vacancy when C. R. Velzy resigned to enter consulting practice. In 1949, Johnson became Gen. Mgr., replacing Frederick W. Crane, who became Commissioner of Public Works of Buffalo. No replacement for Mr. Johnson has been announced as yet.—*G.E.S.*

One-Tenth of U.S. Drinks Fluoridated Water

The California State Dental Association has disclosed that more than 10 per cent of the nation's population — 16,500,000 persons — are now drinking fluoridated water, with California in second place among the States.

Fluoride is being added to the water in 724 communities, with a population of more than 13,500,000, and more than 3,000,000 persons in 1,152 communities are served by water supplies "naturally" containing fluoride, the association said.

Maryland leads all States with a total of 1,545,567 persons living in areas where water is fluoridated. California is second with 1,127,511.

SALVAGE, search, and a few $ $ produced a handy pipe-trailer.

Augusta's Pipe Trailer

From something on hand and trips to graveyards for $75.00 worth of missing parts.

by **"SID." ANTHONY**, *Supt. & Engr., Augusta Water District*
Augusta, Maine

THE foundation for Augusta's "Home-spun" Pipe Trailer was a one and one-half ton cab-over-engine truck of 1941 vintage which had, in turn, carried an express body, dump body, air compressor, and for a time a small air compressor mounted crossways behind the cab with a 1½ yard dump body behind that. That was too much of a load so we retired the truck, mounted the compressor on a trailer and bought a new dump truck.

Rather than let the old chasis go for next to nothing we conceived the idea of making of it a pipe trailer. We had the small derrick and hoisting engine on another rig which was used but little. Scouting the "graveyards", we found a "fifth wheel" in one, a heavy frame in another and a rear end in another, at a total cost of $75.00. A few pieces of angle iron, some hard pine decking, an old smoke stack for fenders, some surplus tires, a few pounds of welding rod and some hours work during the slack time in winter, and we came out with a flat bed trailer seven feet wide and 15 feet long, capable of carrying three to four tons of pipe in convenient form to lower into a ditch direct. It is also very easy to load from railroad car or stock pile to the trailer. It is also very useful in transporting almost any other bulky or heavy material, such as water treatment chemicals from freight car to pumping station.

An improvement planned for this winter is a power swing on the boom. If the mast is not very nearly vertical the loaded boom tends to swing to the low side and is hard to control without a tag line, which requires another man, so a hydraulic cylinder and cables will be fitted so that the hoist operator can swing the load to either side and keep it under one man control. With this improvement it will then also be possible to use the trailer and boom for placing hydrants, valves, large meters, etc.

DUTY at trench side.

DERRICK and hoisting engine.

Illinois A.W.W.A. Section Holds 43rd Annual Meeting

Attendance Tops 400 at Chicago Meeting

Officers

Chairman
H. E. Hudson
Head, Eng. Subdiv.
State Water Survey
Urbana, Ill.

Vice-Chmn.
C. W. Klassen
Chief San. Engr.
Public Health Dept.
Springfield, Ill.

THE three-day meeting of the Illinois Section, A.W.W.A., at the LaSalle Hotel in Chicago on March 18-20, 1953, was its forty-third Annual Convention. Registration totaled 407. Members and guests were welcomed to the city and invited to visit the South Side filtration plant by W. W. DeBerard, Deputy Commissioner for Water and Chief Water Engineer of the Department of Water and Sewers.

The technical program included papers and discussions covering a wide range of subjects—operation, management, finance, and research. There was a group discussion of water system problems, and a panel discussion of waterworks fund diversion. A motion picture "Dust or Destiny," prepared by the Moody Scientific Institute, was presented; this film is devoted to the life and habits of grunnion (fish), bats, and homing pigeons—while an unusual subject, it was enthusiastically received.

Officers were elected at the business meeting, Chairman Oscar Gullans presiding. Reports were presented on the latest action of the A.W.W.A. Board of Directors by F. G. Gordon, and on committee activities by the several committee chairmen. It was reported that two short courses were held in the past year (waterworks and hydraulics) and a course on water treatment chemistry is planned for the fall of 1953. Chairmen of the several technical sessions were C. W. Klassen, H. E. Hudson, C. C. Abplanalp, and Gerald Davis.

Officers 1953-1954

Chairman
H. E. Hudson, Head, Eng. Subdiv., State Water Survey, Urbana, Ill.

Vice-Chmn.
C. W. Klassen, Chief San. Engr., Public Health Dept., Springfield, Ill.

Trustees
C. C. Abplanalp, Dist. Mgr. Wallace & Tiernan Co., Chicago, Ill.
G. L. Davis, Supt. Water Works, Decatur, Ill.
C. L. Baylor, Village Engr. Downers Grove, Ill.

Director
F. G. Gordon, Asst. City Engr., Water Purif. Div., Chicago, Ill.

Secy.-Treas.
Dewey W. Johnson, Research Engr., C. I. Pipe Res. Assn., Chicago, Ill.

Retiring

Chairman
Oscar Gullans
Chief Filt. Chemist
Water Purif. Div.
Chicago, Ill.

Secy.-Treas.
J. Leslie Hart
Western Sales Mgr.
U.S. Pipe & Foundry Co.
Chicago, Ill.

Award and Honors

Recipients of the Section's George W. Fuller Award for 1953 is Dr. Arthur M. Buswell, who was cited for his many contributions to the field of water supply and water treatment. The award was presented by Frank C. Amsbary, Chairman of the Fuller Award Committee.

Presentations were also made to retiring Chairman Oscar Gullans and to retiring Secretary J. Leslie Hart; the plaques awarded recognize meritorious service to the Illinois Section. Mr. Hart has been promoted to Eastern Sales Manager, U.S. Pipe and Foundry Co., and will be stationed in Burlington, N.J.

Social Events

These presentations were made at the annual banquet, the social event of the meeting. The banquet was preceeded by a cocktail hour which was sponsored by the Water and Sewage Works Manufacturers Association. Music, dancing and entertainment followed the banquet. The entertainment committee made available tickets for Chicago radio broadcasts—"Welcome Travelers" and "Breakfast Club."

Officers

Secy.-Treas.
Dewey W. Johnson
Research Engr.
C. I. Pipe Res. Assn.
Chicago, Ill.

Natl. Director
F. G. Gordon
Asst. City Engr.
Water Purif. Div.
Chicago, Ill.

Technical Sessions

"Pollution of Surface Waters" by C. W. Klassen, Chief Sanitary Engineer, Illinois Department of Public Health, was the first of a series of papers and discussions presented to review the subject of water pollution from a state administration standpoint.

Mr. Klassen cited Justice Oliver Wendell Holmes to emphasize the legality of stream pollution control. He pointed out that, while some State Health Departments retain pollution control authority on the basis of its health effect, he considers greater progress can be made in pollution abatement by a balanced approach to problems involved in stream use.

The states of Illinois and Pennsylvania were the first to recognize the rights of various groups to the *use* of streams—but not to their *misuse*. Mr. Klassen reviewed the historical development of Illinois legislation applying to stream utilization. For its cooperative approach, waste legislation is first emphasized and then "not how much, but how little, must industry do?" Mutual understanding and mutual confidence between the

State and its industries is of critical importance. Finally, state problems must be integrated with interstate and Federal programs.

PERRY E. MILLER, Chief, Industrial Waste Section, Indiana Dept. of Public Health, in his discussion of Mr. Klassen's paper agreed that reduction of wastes at the source provides the most economical solution to stream pollution problems; this is true even in instances where a large original investment is required.

Treating Polluted Water

"Pollution Loads and Their Effects on Plant Operation" is the title of a paper prepared by John R. Baylis, Engineer of Water Purification, and J. C. Vaughn, Director of Filtration Labs., Dept. of Water & Sewers, Chicago, Ill. Mr. Vaughn presented the paper.

The experience cited was confined to the treatment of Lake Michigan water in the South Side Treatment Plant. The effect of turbidity was not reported, as this is a minor factor, but the influence of algae, bacteria and sewage pollution are significant.

Plant operating data were cited to illustrate the principal effect of raw water pollution—variations in coagulant requirement. It was emphasized that a coagulant requirement of over 90 lb. per mg is charged to increased requirement caused by a high dosage of activated carbon. The largest requirements for activated carbon, however, result from treatment to control algae odors (the most serious and frequent being caused by Dinobryon). Odors due to oil refinery wastes have occurred during 76 separate periods, totalling 334 days. A plot of taste and odor variations shows regular increases in intensity each afternoon—the maximum being reached late at night. The variation corresponds with periods during which industrial wastes are dumped.

Water is drawn from an intake crib, and is prechlorinated with a dose sufficient to carry residual chlorine through the filters. Carbon is added ahead of chlorine; at time of high requirements dosages of carbon are so enormous that hand dumping must be resorted to. Over 15 million pounds of activated carbon have been used (total) in the years 1948 through 1952.

The total cost of chemicals required for water treatment during this 5-year period is $2,147,590. It is considered that the *extra* cost of chemicals required because of the pollution load (largely industrial wastes) is $462,000; this extra cost is 21.7 per cent of the total cost of chemicals.

Industry Buys Water

"Industrial Water Sales by Public Systems" were evaluated by W. J. Roberts, Associate Engineer, State Water Survey, Urbana, Ill.

Mr. Roberts reported on a survey analyzing the sales breakdown of 580 ground water systems and 250 surface water systems in the State of Illinois. He revealed that private sources pumped total 1,753.2 mgd, while public sources total 2,258.9 (for domestic, commercial and industrial uses). He advised water works management to be aware of the importance of industrial water consumers.

Fuller Award
A. M. Buswell
Chief, State Water Survey
Urbana, Ill.

Industry Pays for Water

"Water Rates for Industrial Users" were discussed by Homer L. Chastain, Commr. of Public Property, Decatur, Ill. Percentagewise the use of water in Decatur is: 59.1% by commercial and industrial, 22.3% domestic, and 18.6% unaccounted-for. In setting up rates, fundamental policies must be devised so that industry pays its fair share of costs.

Decatur recently surveyed its situation, instructing the consulting engineers to establish equitable rates for all users (a condition that did not previously exist). Such rates are especially important because much utility financing is now on a revenue bond basis and costs must be comprehensively covered. In this city a distinction must be made between users of treated and untreated water. There is a great variation in the consumption by commercial and industrial users of the 1.697 billion gallons of water used in one year: over 70% was sold to larger customers. It is important that the largest volume should not be sold below cost.

The newly established rates for residential users include a service charge of $1.65 per quarter, and are

Welcomer
W. W. DeBerard
Deputy Water Commr.
Chicago, Ill.

Trustee
C. C. Applanalp
W & T Co., Inc.
Chicago, Ill.

expected to bring in a revenue of $430,000 per year. The rates for commercial and industrial users include a minimum (fixed cost) charge of $4.50 per quarter and also are designed to account for a revenue of $430,000. It is recommended that certain users receive special treatment (hospitals and other governmental bodies) and that minimum fire service charges be made. The one large user of raw water has a separate contract with the city.

H. S. MERZ, Superintendent of the Rockford, Ill., water department, discussed the paper presented by Mr. Chastain.

Rockford draws its public supply from wells—and because, in the past, industry pumped from private wells, serious overpumping was evident. It was decided that the city needed a water rate so low (for large users) that the use of private industrial wells would be discouraged. The idea worked: in the last 15 years, only two industries have developed their own well supplies.

A bulk pumpage basis indirectly resulted in better distribution, eliminated overpumping, and operates profitably. In 1952 the total consumption was 5.2 billion gallons.

MELVIN P. HATCHER, Director, Kansas City, Mo., Water Department, also discussed Mr. Chastain's paper.

According to Mr. Hatcher, the water works industry cannot be proud of its progress in establishing rates. Electric utilities, on the other hand, know exactly the load factors of industrial consumers and see to it that those consumers pay an equitable share of costs. He believes the "tail rate" of water charges to industry is too low and not equitable. Large consumers are entitled to no more consideration than small ones —except on the basis of volume of consumption and of decreased distribution requirements.

In Kansas City, 15 to 16 per cent of water output is used outside city limits. This volume now accounts

Committee Chairmen

F. C. Ambaty, Jr.
Vice-Pres. & Secy.
Ill. Water Service Co.
Champaign, Ill.

H. H. Gerstein
Asst. Chief Water Engr.
Bureau of Water
Chicago, Ill.

for an equitable part of total charges on the basis of a "demand rate." If a "demand meter" were available, a similar basis could be applied to industrial consumers (including air conditioning users). It is estimated that more than 20 per cent of water usage in this city is for air conditioning.

The variation ratio of industrial consumers to average use is 1.5 to 1.0, but air conditioning is 5.0 to 1.0. Mr. Hatcher recommended a premium price for water usage above the average rate. As a compromise, 16 cents was cited for air conditioning water (and somewhat higher industrial rates). Installed capacity of air conditioning units in Kansas City homes is about 2,000 tons in residences, and 42,000 tons in commercial use. "Demand rates" and air conditioning needs should, he believes, be more adequately covered in the A.W.W.A. Comittee Report on water rates.

Manpower Needed for Research*

"Research Needs in Water Works" were described by L. C. Domke, Superintendent, Pumping and Filtration Plant, Waukegan, Ill., and Armon Lund, Superintendent of Public Works, Wilmette, Ill.

Mr. Domke listed the research needs of the average water works as falling in the following fields: hydraulics, bacteriology, heavy metal and radio-active wastes, organic pollution from biochemical plants, anchor ice formation, waste disposal, plant equipment, filtration and laboratory methods. Since most water plants are classified as either medium or small, the operators of these plants have neither the manpower nor the facilities for conducting research on these problems. Mr. Domke asked who is to do this research.

Armon Lund, in discussing Mr. Domke's paper, pointed out research needs relating to problems affecting water distribution systems.

*The following reports were prepared by J. C. Vaughn, Director of Filtration Labs., Bureau of Water, Chicago.

Table 1

Hardness of Water (in ppm.)	85	250	340	510
Municipal Softening (hardness reduction to 85 ppm.)	—	(.20)	(.27)	(.43)
Salt for home owned softening*	.10	.30	.40	.57
Serviced softening	1.00	1.75	2.30	3.40
Soap	.26	.58	.76	1.08

*These figures do not include amortization cost of a $200 softener purchase .50 to $2.50/1000 gallons for 20 yrs. or 2 yrs. depreciation for avg. family size. (8 yrs.; $1.00/1000 gal.).

He considered these problems as being those of scaling, corrosion, friction losses, water hammer, water consumption and water works management.

Raymond J. Faust, Exec. Asst. Secy., A.W.W.A., discussed the subject and reported that $5,000 has been allotted by the Association's Board of Directors for financing a research program. Four projects are under way. One project on the effects of cadmium and chromium on water supplies is under study at Michigan State College. All schools where such research might

Committee Chairmen

J. R. Gardner
Prin. Engr.
Warren & Van Praag
Decatur, Ill.

C. C. Larson
Chemist & Supt.
Water Purif.
Springfield, Ill.

be done report a considerable shortage of manpower and space. Mr. Faust also reported that the plastic tubing industry has allotted $20,000 for research on plastic tubing: this work is being done under the auspices of the National Sanitation Foundation.

Horace Fry, Evanston, reported that, based on his experience with the fluoridation program at Evanston that, if the City can supply the facilities, financing for research work is not difficult to obtain.

John R. Baylis, Engr. of Water Purification, Chicago, pointed out that where research work is being done it often is not appreciated by management. Unfortunately, consulting engineers frequently do not utilize the results of research.

Prof. N. B. Gamet, of Northwestern University, confirmed the manpower and space shortages reported by Mr. Faust. Mr. Gamet said that at Northwestern University research is being done on a project relating to the electronic analysis of water distribution systems.

The Cost of Soft Water

"Municipal versus Home Softening" was evaluated by T. E. Larson, Head, Chemistry Sub-Division, State Water Survey, Urbana, Ill.

Dr. Larson gave a very thorough analysis of the cost of municipal softening as compared with home softening as applied to moderately hard, medium hard, and very hard water supplies.

He summarized the cost of home owned softeners where the cost of salt for 20,000 grain regeneration may be 30 to 40 cents for the salt ($1.50/100 lb.):

30¢/1000 gal. for 250 ppm hardness
40¢/1000 gal. for 340 ppm hardness
57¢/1000 gal. for 510 ppm hardness

These costs are exclusive of amortization of the softener and personal labor involved in regeneration or handling of salt. The resultant water has a hardness approaching zero.

Commercially serviced softening cost may be estimated to be about $2.30 per regeneration of a 20,000 grain unit at 4 week intervals:

$1.75/1000 gal. for 250 ppm hardness
$2.30/1000 gal. for 340 ppm hardness
$3.40/1000 gal. for 510 ppm hardness

The resultant water again has a hardness approaching zero.

At this point it may be well to point out that the service softened cost for completely softening 85 ppm municipally softened products may be about $1.00 per 1000 gal.

The "effective" cost of softened water per 1000 gallons was summarized by Dr. Larson in a table (Table 1).

A family of four cannot be provided with four weeks service if the hardness of the water is greater than 125 ppm., as illustrated in Table 2. Dr. Larson pointed out that water

Programmers

H. S. Merz
Superintendent
Water Dept.
Rockford, Ill.

G. E. Bostrom
Exec. Secy., Natl. Assn.
Soft Water Serv.
Operators
Chicago, Ill.

Table 2
MAXIMUM HARDNESS (IN PPM.) FOR HOT AND COLD WATER REQUIREMENTS WITH DIFFERENT TYPES OF SERVICE
(20,000 grain capacity unit)

Type of Service	Family Size 2	3	4	5
8 week	125			
4 week	250	165	125	
2 week	500	330	250	200

from a municipal softening plant shows less variability and, in addition, is treated to control color, odor and iron and manganese content.

A discussion was presented by GLENN E. BOSTROM, Exec. Secy., National Assn. of Soft Water Service Operators, Chicago, Ill.

Mr. Bostrom said that Dr. Larson's paper could be entitled "Municipal Plus Home Softening" as it is the object of most home softeners to put a final polish on water that is essentially supplementary to municipal softening. Replying to a question as to who makes the piping changes whenever home softeners were installed, Mr. Bostrom replied that all distributors of home softeners were instructed to comply completely with local plumbing codes when installing such softeners. Some discussion ensued on the bacterial quality of the water from home softeners during the period immediately after installation. There seemed to be little knowledge on this matter.

Be a Good Executive

"Bettering the Management Job" is the title of a paper presented by R. L. Peterson, Business Management Service, University of Illinois, Urbana.

Mr. Peterson outlined the principles characteristic of a good executive. The more important of these are planning, delegation of responsibility, putting first things first, following a daily schedule, selectivity in seeing people, desk efficiency, and developing an understanding of people. He described some methods by which people could be inspired with the desire to work, as follows: Provide incentive; have weekly staff conferences; give employees enough work to do; have periodic talks with individual employees; give special privileges to special employees as a reward for special accomplishment; develop "in group" spirit; make individuals feel important; and provide effective supervision.

Programmers

J. C. Moomau
Manager
No. Ill. Water Corp.
Sterling, Ill.

M. C. Stout
Prin. Asst. Engr.
Ind. Water Co.
Indianapolis, Ind.

Water Pressure Indications

"Judging Radio-TV Programs via Water Consumption" was reported by James L. Weeks, Mech. Engr. in Charge, Operating Div., Department of Water, Chicago, Ill.

Mr. Weeks reported on the effects of TV and radio programs on water pressure and consumption. Pressures dropped from 3 to 18 lbs., mostly in purely residential sections, following the more popular programs. Observation of these pressure drops go back as far as the Louis-Braddock fight. The greatest drop occurred on the night "Lucy had her baby." Mr. Weeks showed slides of numerous pressure charts which indicated whether certain programs were of one hour or one-half hour duration. Mr. Weeks concluded that such information could *not* be interpreted as a secondary Hooper Rating.

Programmers

S. C. Casteel
Manager
Interurb. Water Co.
E. St. Louis, Ill.

M. P. Hatcher
Director
Water Dept.
Kansas City, Mo.

Group Discussion on Operating Problems

"Extensions Outside the City" were discussed by Lester E. Culverson, Commissioner of Public Health and Safety, Elgin, Ill.

Mr. Culverson gave an outline of the hidden costs (those costs not directly and obviously chargeable in extending water service to customers beyond the City limits). He then discussed the proposed formation of a greater Chicago water authority.

"Filtration Plant and Corrosion Problems" were reviewed by Henry A. Haferkamp, Superintendent, Water Dept., Staunton, Ill.

Mr. Haferkamp reported on the extensive corrosion problem caused in Staunton by the use of mine wastes and cinders as road and backfill material. Specimens of badly corroded pipe from the system were illustrated by the lantern slides.

Programmers

J. R. Baylis
Water Purif. Engr.
Chicago, Ill.

J. C. Vaughn
Filt. Labs. Director
Chicago, Ill.

"Operating Records" were described by Maurice C. Stout, Principal Asst. Engineer, Indianapolis Water Co., Indianapolis, Indiana.

Mr. Stout reported on the advantages of modern adequate records. Such records will point out weaknesses, curb extravagances, and reduce excess costs. The advantages of a card index system in maintaining a perpetual inventory of material and supplies were outlined.

"Meter Reading Practice" was the title of a panel discussion led by J. C. Moomau, Manager, Northern Illinois Water Corporation, Sterling, and Stephen C. Casteel, Manager, E. St. Louis and Interurban Water Company, E. St. Louis.

The panel on meter reading practice was devoted essentially to methods and techniques of handling meter readings in the various communities. Mr. Merz reported that Rockford uses firemen on the off days (the Rockford firemen work the platoon system of 24 hours on duty and 24 hours off duty) with alternate platoons on alternate days. This practice has proven quite successful. Rockford also uses the Remington-Rand Routing System for meter readers. In this system, the meter reader goes completely around each of four blocks from one street intersection and then moves on to another intersection where he follows the same procedure.

Safety is Economical

"Saving Money Through Safety" is the title used by Raymond J. Faust, Exec. Asst. Secy., A.W.W.A., New York, N.Y.

Mr. Faust discussed the report of the National Safety Council on utilities. This shows the water utilities to be low in standing on the relative frequency and severity of accidents. He pointed out that only 33 plants were reporting to the National Safety Council.

As to why water utilities lagged in safety programs, Mr. Faust sug-

gested it might be due to the following reasons: (1) two-thirds of the water systems are under control of City Councils. (2) the plants usually are small and quite isolated from the rest of the community.

Mr. Faust defined accidents as man-made mistakes, nearly always due to carelessness and lack of planning. He then discussed the economics of accident prevention, showing how safety programs, by saving money, can make money. In conclusion, Mr. Faust stated that a safety program requires little capital outlay.

Discussion on Diversion of Waterworks Funds

L. K. Crawford, Consulting Engineer, Crawford, Murphy and Tilly, Springfield, and H. S. Merz, Superintendent, Water Dept., Rockford, discussed the subject of "Diversion of Waterworks Funds."

Mr. Crawford outlined some of the points in favor of such fund diversion. He called attention to the fact that many municipalities divert substantial amounts of gas tax, parking meter, and other funds from their designated purpose without any objection from the water works people. He suggested water works operators would do well to evaluate the picture as a whole. It is well known that, because the public opposes additional tax legislation in any form, public officials resort to diversion of available funds. Water works operators should remember that all are citizens of the community.

Mr. Mertz of Carthage, Ill., pointed out most vigorously that many efficient and well-meaning superintendents are the victims of the current practices in fund-diversion.

Mr. Merz of Rockford, suggested that fund diversion may be regarded as an equivalent to dividends. Such diversion can be controlled, but, once started, it is impossible to stop the procedure entirely. The City of Rockford has enacted an ordinance based on the return on the capital investment, payment in lieu of tax, rent, franchise, legal expense, credit for hydrant rental and fountain supply, which determines and limits the amount to be paid to the City. This has worked out very well. Rockford, however, has no depreciation fund other than 1½% on a $250,000 bond issue.

How to Pay

"Financing Waterworks and Waterworks Improvements" is the title of a paper presented by Allan Blair, Allan Blair & Co.

Mr. Blair pointed out that bonds sold by water utilities are now mostly revenue bonds, which have superseded the general obligation bonds formerly in favor. There is no limit on revenue bonds except the earning capacity of the utility. They cannot be used as liens on property, only on earnings. Mistakes made in drawing up the bonds are appropriated for the life of the bond. Therefore, thorough, intelligent, careful effort pays off.

He outlined the procedures that must be taken by investment houses to protect their interests in water system securities. Each year the activities of the system must be reviewed. Two reports, covering 224 items, must be compiled. Adequate and accurate information must be kept up to date, and the cost of such information surveys are paid in interest rates. Therefore, it would be well for water system supervisors to maintain such records for the benefit of the investment houses.

Mr. Blair suggested that, to aid in maintaining such records, water systems should (1) install modern utility accounting systems, (2) have an annual audit made by an independent accounting firm, even if this is not legally required. He reminded listeners the failure to have adequate and accurate information available may be considered a technical default on the bond. He suggested that, in offering bond issues for sale, taking bids is better than negotiation except in certain cases. In conclusion, he pointed out the interest rates on bonds are tending strongly upward. Revenue bonds have received from 2.45% to 2.70% since January 1, 1953, for the best 20 municipal bonds studied.

Rollo Blanchard Dies Suddenly

Rollo Kimball Blanchard, who retired on January 1, 1953, from his position as Vice-Pres. & Engr. of the Neptune Meter Co., New York, died suddenly in Clearwater, Fla., on April 25th. He had been an A.W.W.A. Director and for 21 years Secretary-Treasurer of the New York Section of A.W.W.A.

Mr. Blanchard, with an M.E. degree from Cornell University in 1910, joined the Weber Pump Co., and transferred to the Neptune Meter Co. (the parent firm) as engineer in 1912. He became chief engineer of Neptune in 1916, engineering ass't. to the president in 1917, and vice-president and director in 1924. Although retired from active duty he continued to serve as a member of Neptune's Board.

During his career, Mr. Blanchard had served a number of terms as a member of the Board of Governors and as president of the Water Works Mfgrs. Assn. (now the Water & Sewage Works Mfgrs. Assn.) as a member of the A.W.W.A. Water Works Practice Committee, and as chairman of the Board of Water Commissioners of his home town, Irvington, N.Y. During World War II, he was a member of the Engineering Advisory Committee of the War Production Board.

Mr. Blanchard was an early recipient of the George W. Fuller Award from the Am. Water Works Assn. and ever since its organization had served as secretary of A.W.W.A.'s Fuller Award Society. A special citation from the Directors of A.W.W.A. was presented to him in January upon his retirement. Mr. Blanchard was a member of the A.S.M.E., the A.S.C.E., the Engineer's Club and the University Club of New York City. He is survived by two sons and a daughter.

R. S. Clark Leaves Avon, N.Y. to Sell Waterworks Supplies

Relly S. Clark, Supt. of Water at Avon, N. Y., resigned on April 8 to accept a position as Sales Engineer, in charge of the Water Works Sales Division of Haverstich & Co., jobbers of Rochester, N. Y.

Mr. Clark, who has been superintendent of the Avon Water Dept. for eight years was formerly distribution representative for the Niagara-Mohawk Power Co. In his new position he will cover 14 counties of Western New York State, handling water and sewage works supplies (valves, hydrants, fitting, jointing materials, etc.) including the Mueller and Dresser lines. He will work out of Avon but have his office at Haverstich & Co., Ford at Spring St., Rochester, N. Y.—*G.E.S.*

Air Conditioned Chemical Conveyor Solves Water Treatment Problem

Ferric Sulfate Clogging Eliminated by Dry Underground Conveyor

by F. L. ANDREOLI, *Field Engr., Worthington Corp., Boston, Mass.*

THE Scituate water treatment plant of Providence, R.I., encountered—and solved— a serious problem in the operation of its dry chemical conveying lines. It was found that the pneumatic conveyer system, which carried chemicals from the storage silo to the main treatment plant 600 feet away, was not performing satisfactorily.

The water coagulants, ferric sulphate and lime, are conveyed through two 4-in. underground steel pipes, each pipe system being independent of the other, even to the air compressors. After the first four to six weeks of operation it became evident that, while the lime conveying system performed without change, the ferric sulphate system acted as though there was an ever-increasing resistance in the line. Investigation revealed that the ferric sulphate, which is hygroscopic in nature, was solidly coating the interior of the conveyer pipe, because of moisture accumulation from the air.

Iron Coagulant Coating

In the succeeding months, the operators found that every five to six weeks, even during the winter months, it was necessary to shut the system down for cleaning. This involved flushing the pipes with water to dissolve the solids, blowing out the water and drying the system before again putting it into operation.

Several schemes to overcome the difficulty were simultaneously considered. One proposed method of alternating lime and ferric sulphate movement in the pipes appeared to have merit, but was abandoned since it might result in inadvertent mixing of the chemicals in the wrong proportions. Two other methods, namely conversion to a vacuum conveyer system and chemical dehydration of air before introduction into conveyer system, were rejected as being too expensive and involved too many other changes.

Air Conditioning by Refrigeration

The desirable system had to be fool-proof, compact, neat in appearance and nominal in cost. Dehumidification by refrigeration best fitted these requirements. The Air-rite Engineering Company of Pawtucket, R.I. designed such a system at a reasonable cost and was awarded the contract.

In spite of the fact that the installation was being made at a city water supply plant, the contractors were asked to design a system utilizing air for refrigerant condensing, since 600 feet of the dry chemical conveyor piping from the main building was underground, restriction was the necessity for reliability of the system under any sequence of temperature and humidity conditions which might occur the year round. Chemical conveying is necessary on days of relatively high humidity and moderate temperature, following a long period of zero or sub-zero weather. Under these severe conditions, the system should be capable of properly dehydrating air to prevent condensation in the conveyer line, which at some points is only 2 to 3 feet below ground level.

Design Requirements

The first consideration was to establish basic information for both summer and winter extremes; maximum temperature and humidity of outside air and minimum

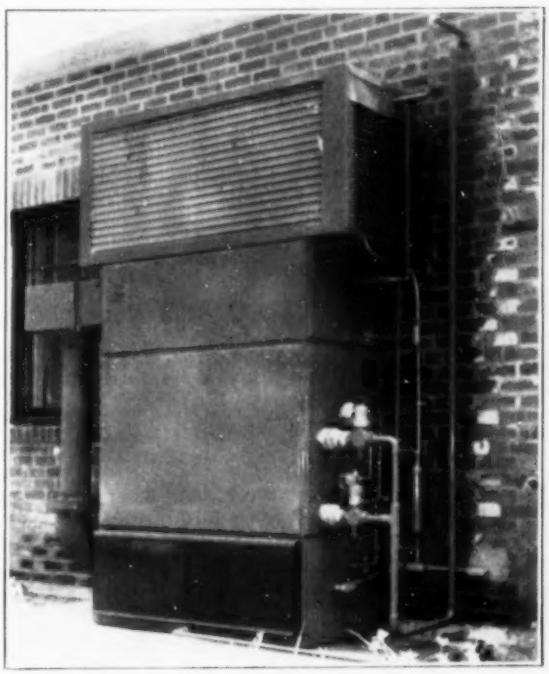


Fig. 1—SPECIAL DEHUMIDIFIER, Scituate water treatment plant, Providence, R. I. Outdoor installation of Worthington air conditioner, reheat condenser, and air cooled condenser in a compact unit.

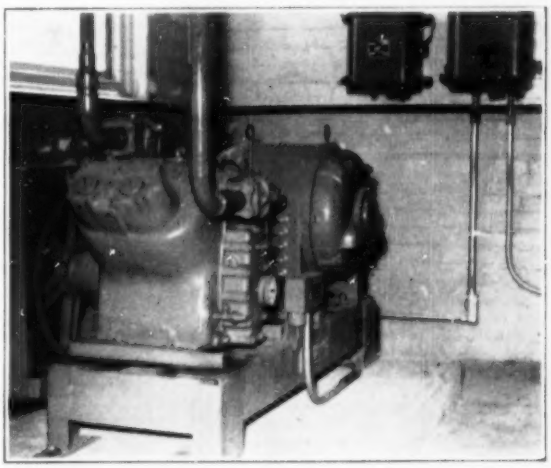


Fig. 2—COMPRESSOR, a 10 H.P. unit, is installed indoors.

probable underground pipe surface temperature. Obviously, pipe surface temperature will vary with the depth of the pipe underground. While the required dehumidification load during extreme summer conditions could be calculated, determination of the exact load for winter conditions was more difficult. Prolonged periods of extreme cold followed by sudden moderate temperatures with high humidity would result in considerable condensation in the pipe.

Accordingly, the size of the dehumidification refrigeration system was established by summer design conditions and it was determined that its capacity would be great enough to handle the load, even assuming pipe temperature down to 20°F, which should be safely below actual winter temperature conditions.

Since the system was for intermittent operation only, it was satisfactory to design for frosting on the coils to obtain dehumidification below freezing temperatures. Calculations indicated 12 rows of coil would be sufficient. To be conservative, the unit was fitted at very little extra cost with 2 rows of finned coils having 4 fins to the inch to take care of the frost.

The filter and coil section of a standard Worthington air conditioner were used. To these was added a reheat condenser by which the air after dehumidification is reheated by condensing Freon from the compressor discharge. Supplementing this reheat condenser, is an air cooled condenser, which was top mounted on the frame to form an integral, compact unit as shown in Fig 1. The compressor, illustrated in Fig. 2, is an F-12 unit of 10 H.P.

Results After Two Years

The dehumidification system was installed and placed in operation in November 1950. To date, more than two years later, it has not been necessary to clean the pneumatic conveyor system. In fact, operators have found that the conveying pressure is slightly less in the ferric sulphate system than when the system was originally installed. This condition indicates that extreme dehumidification of the conveyor air has probably resulted in erosion of the already existing encrustation on the pipe walls.

This application of air conditioning to the chemical lines has solved a maintenance problem—the annual cost of which had been indicated to be $1,500 to $2,000.

Experience at the Providence plant may be applicable to similar or related chemical conveying needs in other installations.

Methyl Purple vs Methyl Orange In Alkalinity Titrations

by RALPH W. FREY, Chemist, Washington Suburban Sanitary Comm., Hyattsville, Md.

RECENTLY there has come on the market an indicator known as methyl purple, with suggestions that it might be substituted to advantage for methyl orange in alkalinity titrations.

Most chemists know of the unsatisfactory behavior of methyl orange as an indicator. Its use frequently creates a desire for something that gives sharper and more contrasting color changes; requires less time; does not involve so much indecision and whose results are not so dependent upon the moods and color-consciousness of the individual.

Standard Methods for the Examination of Water and Sewage, 9th Edition, American Public Health Association, specify under "Alkalinity of Water" and also "Alkalinity of Sewage" the use of methyl orange, *or its equivalent*. Appreciating the opportunity that methyl purple might offer in replacing methyl orange in the alkalinity determination procedure strictly comparable titrations of sewage, chiefly sanitary, and of non-potable waters were made with these two indicators.

The results here presented need no elaboration. The end-point carried to a distinct purple with methyl purple is pleasingly sharp and far superior to that of methyl orange. The figures given show definitely that methyl purple can be substituted for methyl orange, a substitution that will prove most gratifying.

Table I
METHYL PURPLE VS METHYL ORANGE
(River and Branch Waters)

Station	Collection Date	Kind	Alkalinity-ppm Methyl Purple(1)	Alkalinity-ppm Methyl Orange(1)
1	1/26/50	grab	15	19
2	"	"	17	21
3	"	"	51	56
4	"	"	45	50
5	"	"	41	41
6	"	"	60	59
1	12/14/50	"	21	22
2	"	"	21	23
3	"	"	58	59
4	"	"	26	29
5	"	"	29	31
6	"	"	31	33
11	11/21/50	"	10	11
15	"	"	12	14
16	"	"	18	18
17	"	"	17	18

(1)—With 4 drops of phenolphthalein.

Table II
METHYL PURPLE VS METHYL ORANGE
(Sewage Treatment Plant No. 1)

Sewage	Collection Date	Kind	Alkalinity-ppm Methyl Purple(1)	Alkalinity-ppm Methyl Orange(1)
Raw	11/12/50	24-hr.	96	92
Primary	"	"	102	98
Final	"	"	96	96
Raw	11/16/50	24-hr.	140	140
Primary	"	"	126	128
Final	"	"	116	114
Raw	11/19/50	24-hr.	124	128
Primary	"	"	146	140
Final	"	"	144	152
Raw	11/23/50	24-hr.	120	124
Primary	"	"	142	144
Final	"	"	104	106
Raw	11/26/50	24-hr.	84	80
Primary	"	"	88	84
Final	"	"	88	86
Sewage Treatment Plant No. 2				
Raw	11/13/50	grab	184	188
Primary	"	"	204	216
T.F.E.	"	"	168	172
Final	"	"	140	140
Raw	11/17/50	"	152	152
Primary	"	"	212	220
T.F.E.	"	"	140	132
Final	"	"	136	128

(1)—With 4 drops of phenolphthalein.
T.F.E.—Trickling Filter Effluent.

Table III
METHYL PURPLE VS METHYL ORANGE
(Aged Sewage[1] - Treatment Plant No. 1)

Sewage	Collection Date	Kind	Alkalinity-ppm Methyl Purple(2)	Alkalinity-ppm Methyl Orange(2)
Raw	12/ 2/50	24-hr.	116	114
Primary	"	"	94	98
Final	"	"	88	90
Raw	12/5/50	"	98	94
Primary	"	"	104	98
Final	"	"	108	102
Raw	11/30/50	"	122	116
Primary	"	"	120	114
Final	"	"	120	116

(1)—Aged at 22°-26°C in open jar, then made to original volume with distilled water. First two groups aged 48 hrs.; last group aged 72 hrs.
(2)—With 4 drops of phenolphthalein.

Simplified Field Test for Iron in Water

by MAXIM LIEBER, Sr. Sanitary Chemist, Nassau County Dept. Dept. of Health*
Hempstead, N.Y.

FLUORIDATION of water has become an accepted public health measure. Information pertaining to the advantages of water fluoridation has been disseminated to the public; and, on the whole the public has accepted fortification of water in the interest of tooth protection for the oncoming generations.

At the present time, Nassau County (Long Island) has one community which is fluoridating its water—namely, Carle Place, N.Y. It is anticipated, however, that many other County supplies will be fluoridated in the not distant future.

From the laboratory standpoint, it is imperative that water plant practicing fluoridation have at its disposal the necessary means for measuring the fluoride ion content of water. This test has to be utilized by the plant operator in checking the treatment and in measuring the fluoride content of the water in the distribution system as it reaches the consumer. Iron, when present in the water, interferes with the fluoride test and gives high results.

Many of the ground waters in Nassau County contain iron in appreciable amounts. In some instances, we have found ground water containing as much as 4.0 ppm of iron. In the Alizarine-Lake reaction for fluorides, Maier[1] reports a positive error when iron is present in excess of 0.5 ppm. It has been our desire to find a simplified test for total iron in water, which would permit plant operators and field personnel to utilize this test within a reasonable degree of accuracy.

Wood and Mellon[2] investigated the thiocyarate method for iron. Their efforts were directed to adaptation of hydrochloric acid and nitric acid as the acid reagent employed in the test. Hallinan[3] attempted to simplify the elaborate official laboratory procedure for total iron by the thiocyarate method which appears in Standard Methods of Water Analysis[4]. He employed the hydrochloric acid reagent, performed the test in 2 ounce (28mm) French square bottles and also formulated a set of permanent iron standards for use in his procedure. His method involves heating the acidified sample in a water bath for twenty minutes, allowing the sample to cool to room temperature (usually 15 minutes) and then proceeding with the test. The time element in heating and cooling the sample in the field is not conducive to the employment of this procedure away from the laboratory.

A Simplified Field Test

In our attempts to satisfy our requirements for a field test, we have found that by changing the acid used by Hallinan, the test for total iron can be easily accomplished. Instead of using the hydrochloric acid reagent (345 conc. HCl/L), we substituted a 50% sulphuric acid reagent for the field test. The exothermic reaction generates sufficient heat to dissolve the iron present in the sample and in turn eliminates the necessity for heating the acidified sample in a hot water bath for twenty minutes. Our results with this simple change in procedure are as accurate as the more more laborious and time consuming method formulated by Hallinan[3] when utilizing his permanent iron standards.

The potentialities of this procedure as a field test can be noted by comparing the results of one of the many series of tests conducted in this laboratory (Table I).

Table I

Prepared Test Solution Containing Iron ppm	Comparing Samples on a Photoelectric Colorimeter & Utilizing a Std. Curve		Comparing Samples Against Hallinan's Permanent Stds.	
	HCl-Reagent Hallinan Procedure ppm	H_2SO_4-Reagent Field-Test ppm	HCl-Reagent Hallinan Procedure ppm	H_2SO_4 Reagent Field-Test ppm
0.0	0.03	0.03	.....	.....
0.25	0.25	0.25	.....	.....
0.50	0.45	0.50	0.4	0.5
0.75	0.75	0.70	0.6	0.7
1.00	1.00	0.95	0.9	0.9
1.25	1.26	1.22	1.1	1.1
1.50	1.5	1.45	1.4	1.4
1.75	1.75	1.65	1.7	1.7
2.00	2.0	2.0	1.9	1.9
2.5	2.5	2.5	2.4	2.3
3.0	3.01	3.05	2.75	2.70
3.5	3.5	3.5+	3.2	3.2

Field Test Procedure

To 30 ml of the sample in a 2 ounce (28 mm) French square bottle, add 20 ml of 50% H_2SO_4. Allow the acidified sample to stand for 15 minutes. Add a few drops of potassium permanganate (6.3 gm/L) or just enough of this reagent to retain a pink color for one minute. Add 5.0 ml. of potassium thiocyanate (300 gm/L) and immediately compare against the permanent standards formulated by Hallinan[3] and prepared in similar 2 ounce French square bottles.

Table II

Iron Content* ppm	Platinum Sol'n ml	Cobalt Sol'n ml	Copper Sol'n ml
0.40	1.90	1.00	0.20
0.60	2.60	1.90	0.80
1.0	4.60	3.80	4.60
1.5	6.90	6.15	6.60
2.0	8.95	8.45	8.00
2.5	11.0	10.8	9.20
3.0	12.6	13.2	10.2
4.0	15.6	17.8	11.6

*Equivalent concentration of iron in 30ml sample

Preparation of Permanent Iron Standards

Potassium Chlorophatinate, K_2PtCl_6. Dissolve 4 gms in distilled water. Add 200 ml of conc. HCl and dilute to 1 liter with distilled water.

Cobaltous Chloride. $CoCl_2 .6H_2O$. Dissolve 48 gms in distilled water. Add 200 ml of conc. HCl and dilute to 1 liter with distilled water.

Cupric Chloride. $CuCl_2 .2H_2O$. Dissolve 12 gms in distilled water. Add 100 ml of conc. HCl and dilute to 1 liter with distilled water.

Put the volumes of color solutions specified in Table II into 2 ounce (28 mm) French square bottles and make up to 50 ml with distilled water. These permanent standards should be compared to freshly prepared iron standards. If necessary, the volumes of color solutions should be adjusted to give a close visual match.

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2—Woods, J. T. & Mellon, M. G.—"Thiocyanate Method for Iron" Industrial and Engineering Chemistry, Analytical Edition, Vol. 13, No. 8, 1941, Pg 551.

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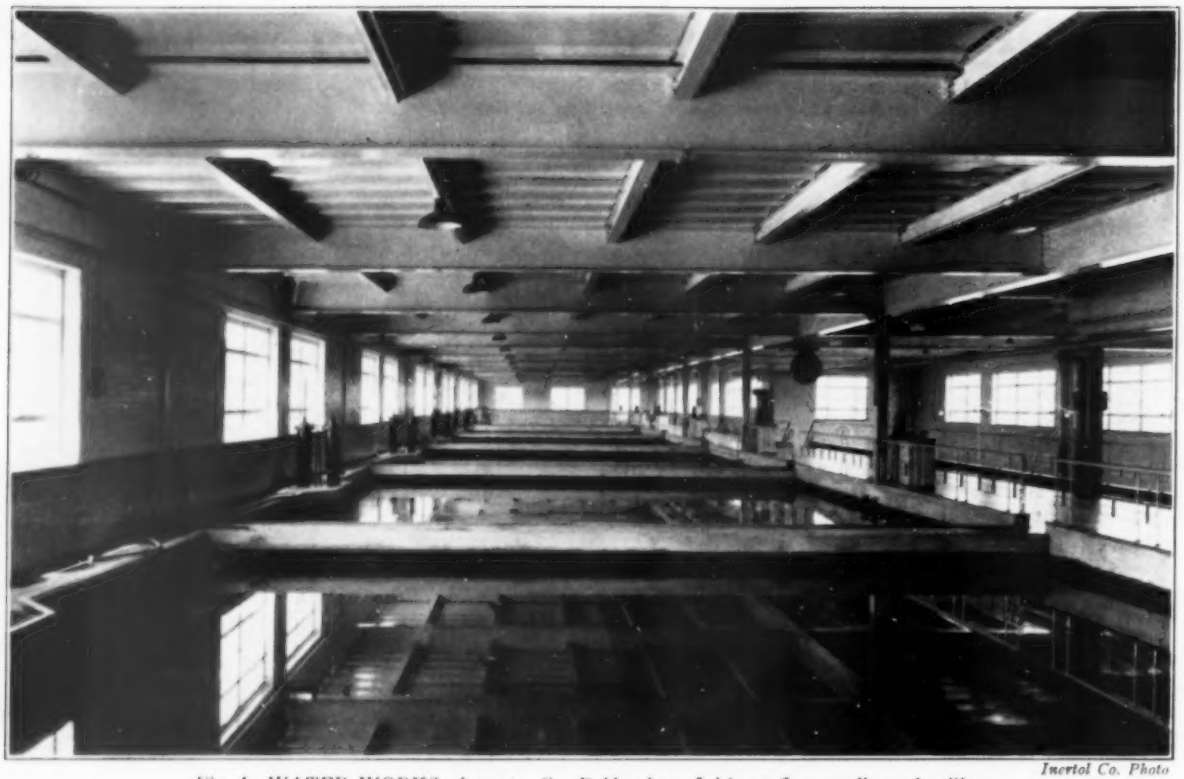
4—Standard Methods for the Examination of Water and Sewage A.P.H.A., 9th Edition, 1946.

*Division of Laboratories and Research.



Inertol Co. Photo

Fig. 1—WATER WORKS, Augusta, Ga. Rubber-base finish on floor, walls, and ceiling

Chlorinated Rubber Finishes in Water and Sewage Works

by FRED K. SHANKWEILER, *Manager, Chlorinated Product Sales*
Hercules Powder Co., Inc., Wilmington, Del.

CORROSION, condensation, attacks from sewage fumes and the elements, are problems that every water and sewage treatment plant must constantly face and attempt to solve. Economical plant operation may hinge on the proper selection of protective coatings. The right finish can increase efficiency and greatly extend the useful life of both plant and equipment.

No single protective coating ever has been developed which can successfully cope with all the various factors which make the use of such material necessary. Primarily, the problem resolves itself into the development of a suitable surface finishing system, involving a number of coatings, to be used where it offers specific advantages. Cost is a factor which cannot be overlooked, but it usually must be measured not only in terms of the expense of the original material, but of labor for application and of service life. In today's plants, appearance, too, is assuming increased importance. Coatings which provide protection *plus* color will have preference over those available only in blacks, grays, and dark shades. Finishes based on chlorinated rubber (Parlon) combine all these desirable qualities.

Useful Characteristics of Chlorinated Rubber

The outstanding alkali and acid resistance of chlorinated rubber-base paints, so desirable in finishes for waterworks and sewage disposal plants, was responsible for their initial development as protective coatings. England and Germany were first to use chlorinated rubber as a base for protective coatings, and Hercules Powder Company was the first to import it to the United States for use in formulating more satisfactory paints for installations subjected to corrosive acid vapors. Early experience with the material encouraged the company to undertake its own production of chlorinated rubber on a pilot plant scale. Acceptance has continued to increase until the material today enjoys a wide and growing market.

Both as a concrete and metal finish, chlorinated rubber-base paints are especially fitted to serve under conditions too severe for regular paints and enamels. Paints can be formulated which offer stubborn resistance to acids, alkalies, oxidizing agents, bleaches, cleaning compounds, vapors and fumes of various kinds, mold and mildew, cement alkali, plaster, and lime. As a finish on cement, the chlorinated coating resists the attack of alkalies within the concrete, and at the same time withstands corrosive agents attacking the surface. Used on metal, chlorinated rubber gives excellent protection because of its imperme-

ability and resistance to corrosive agents such as acid and alkali solutions and fumes. There is no breakdown of the film and resultant deterioration of the surface it protects.

Resistance to Acids and Alkalies

The acid resistance of chlorinated rubber is dramatically illustrated in Fig. 3, showing iron nipples which were coated with chlorinated rubber. The view on the left shows a nipple on which the coating covering the threads was cut away to expose the bare metal. The nipples were then immersed in 10 per cent hydrochloric acid for a period of thirty days; when removed they were in the condition shown. Note how the metal at the point where the coating was removed is almost completely eaten away. The chlorinated rubber on both test nipples is unimpaired, still retaining a high gloss.

Comparable evidence of the resistance of chlorinated rubber to a caustic solution appears in Fig. 4. This illustrates an aluminum nipple treated in a manner similar to that described above, with a section of the coating removed after applying, to bare the aluminum surface (as shown at left). How such a nipple appeared after immersion in a solution of 10 per cent caustic soda for a period of thirty days is shown in the photo at the right. Note how the caustic has eaten away the metal, even to the point where the chlorinated rubber coating is nothing more than a thin shell; but the coating itself, and the metal protected by it, remain unharmed.

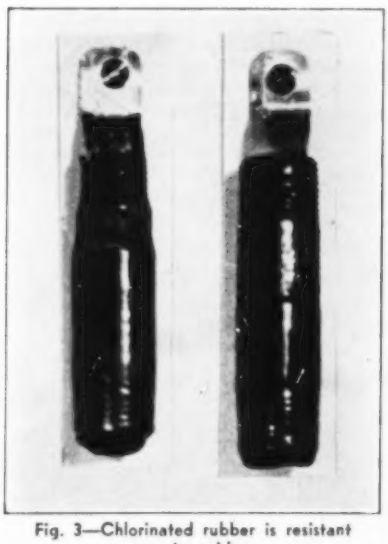
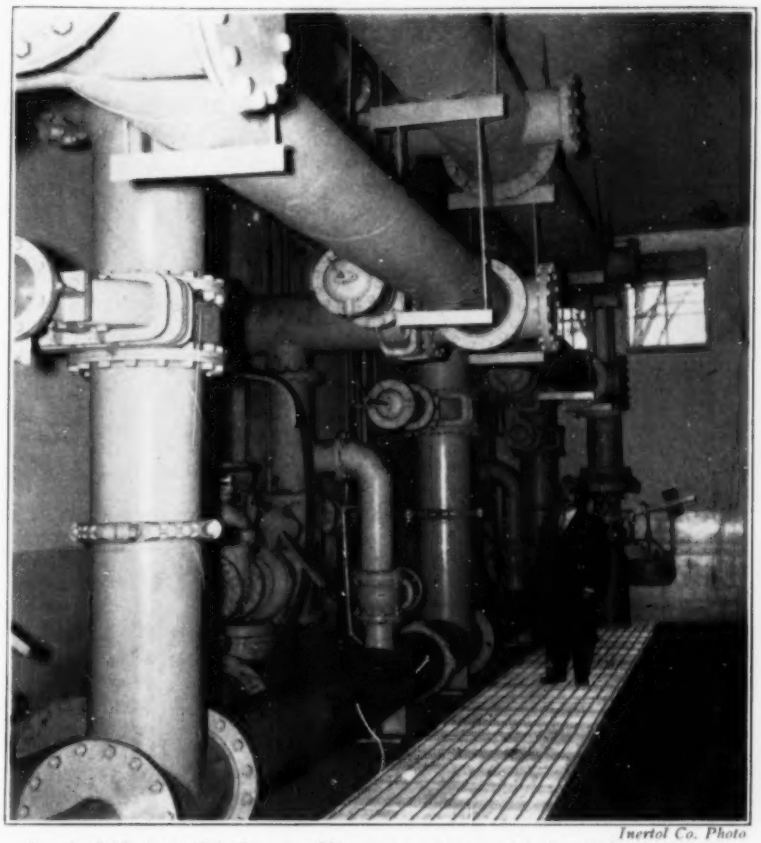


Fig. 3—Chlorinated rubber is resistant to acid

Iron nipples after 30 days in 10% hydrochloric acid. Top of left specimen was not protected by paint.



Inertol Co. Photo

Fig. 2—PIPE GALLERY, Bucyrus, Ohio, water plant protected and brightened by rubber-base enamel.

Chlorinated Rubber Finishes for Specific Purposes

Parlon (chlorinated rubber) finishes have been made and sold for special-purpose maintenance in this country for more than fifteen years. They are generally speaking of two types: one type modified with long-oil alkyd resins to develop maximum toughness and wear resistance; the other type combining Parlon and chemically inert resins and plasticizers for use where maximum hardness and chemical resistance are controlling factors. Parlon finishes provide a high degree of adhesion to surfaces for which sandblasting and flame scaling are not applicable; they are quick-drying, permitting prompt recoating in application of the complete coating system; and their cost is low in terms of original cost divided by coating life.

Water Works Applications

Chlorinated rubber-based paints have similarly demonstrated maintenance superiority in water and sewage plant installations from coast to coast. Fig. 1 is an interior photograph of the Augusta, Ga., water filtration plant. Paint based on Parlon was applied here to the floors, walls, ceilings, and walks over filter units. The paint has imparted a tile-like, durable finish which stays color-fast and hard under strongest

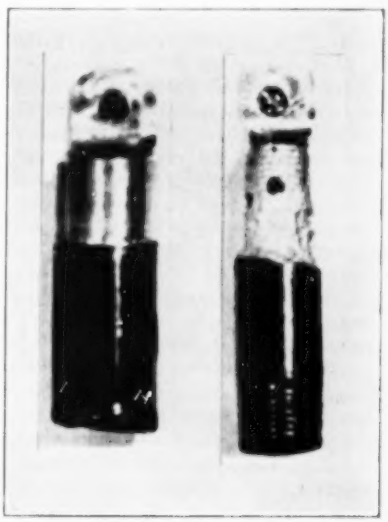


Fig. 4—Chlorinated rubber is resistant to alkali

Aluminum nipple in 10% caustic for 30 days. Left and right specimens illustrate "before" and "after" exposure.

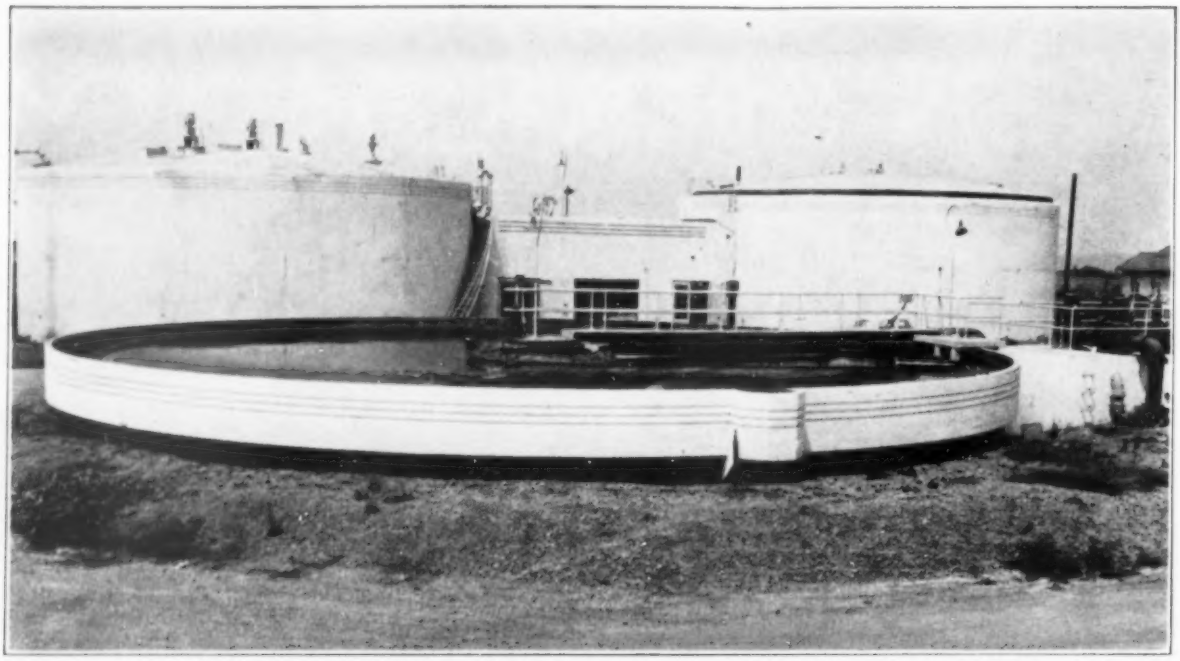


Fig. 5—SEWAGE PLANT, San Leandro, Calif. Rubber-base finish on clarifier, digesters, and control building.
Light cream masonry paint is over 3 years old and in good condition.

cleaners; it is unaffected by lime in green concrete.

The pipe gallery of the Bucyrus, Ohio, water plant is illustrated in Fig. 2. For this application, a glossy, chlorinated rubber-based enamel (Ramuc Utility) protects and beautifies the walls, ceilings, and piping. Its ability to remain colorfast and hard under the strongest cleaners has been demonstrated.

Sewage Works Applications

The San Leandro Sewage Disposal Plant in California, Figs. 5 and 6, provides an excellent illustration of the successful use of chlorinated rubber-based finishes under difficult conditions. After 2.5 years of exposure to corrosive conditions — sulphide gases, heavy salt sea fog, heat, cold, and condensation—the protective coating is still intact. Located only a few feet from San Francisco Bay, the site of the San Leandro plant presented many unusual maintenance problems in addition to those normally prevalent at such installations. No finish seemed able to cope with the elements and maintain a good degree of appearance and protection for more than a few months. However, the chlorinated rubber-based finishes applied in 1949 remain in excellent condition today—after more than 30 months of exposure — even at such key points as the grit conveyor where sewage enters the plant and on pipes and railings directly exposed to corrosive fumes from open sewage channels. The chlorinated rubber finish has successfully withstood cleaning with strong solutions, including gasoline; it is lime resistant and will not blister.

This complete coating system at the San Leandro plant is based on recommendations made by Clyde C. Kennedy, San Francisco consulting engineer, and employs Inertol finishes of four different types. The flat finish on the concrete structural work, and the glossy enamel finish on the metal work, are both chlorinated rubber paints especially formulated for alkali and acid resistance. Submerged concrete surfaces are painted with a highly refined coal tar pitch, with an additional coat of extra thickness applied in a 4-ft. band over the regular coats at flow lines and channels where abrasion and chemical action are most severe.

H. J. Mills, plant superintendent, can rightly be proud of the appear-

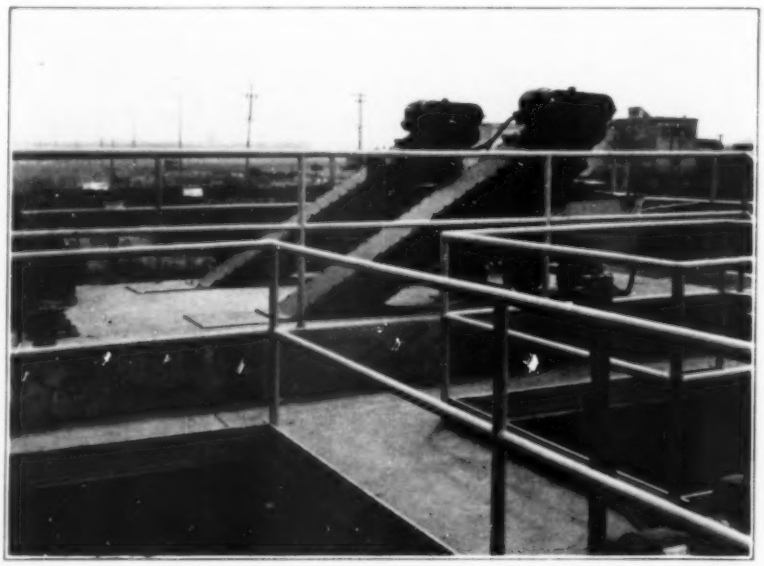


Fig. 6—GRIT CONVEYOR mechanism housings, San Leandro plant, protected with two coats of rubber-base enamel.

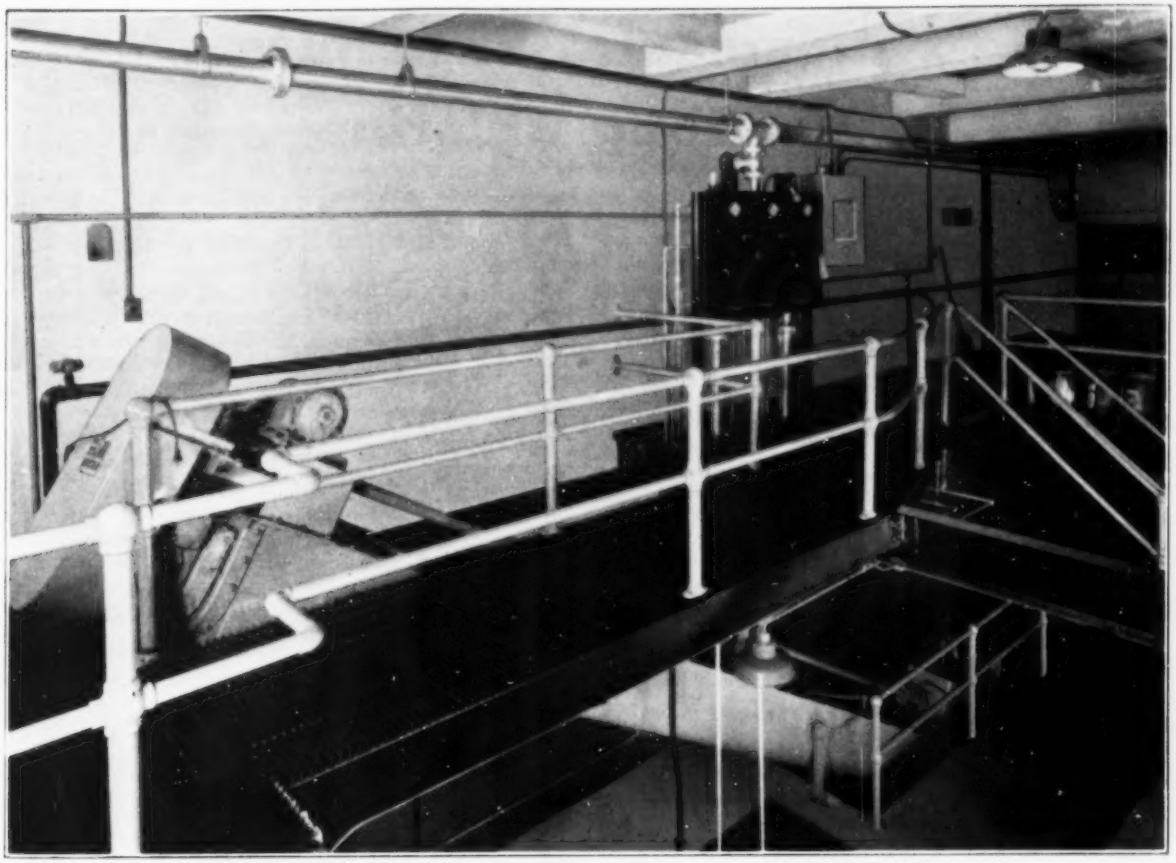


Fig. 7—INTERIOR use of rubber-base enamel at West Side Sewage Plant, Bridgeport, Conn.
Note light colors used on steel and concrete walls and ceiling.

ance of his installation. He considers one of the big advantages of the chlorinated rubber paints—used on the digesters, clarifiers, and control buildings—their attractive fadeproof colors, which contribute greatly to the efficient and sanitary appearance of the plant. The coatings are fast-drying and easy to apply, so that the plant staff has been able to paint new structures as they have been added to the installation, eliminating the need for outside labor for either new construction or maintenance.

In applying the present coating system, all concrete structures were sandblasted prior to painting. Since the chlorinated rubber finish is completely lime resistant, no neutralizing wash was required and the present finish, three years old, consists of two coats of Ramuc Masonry Paint applied directly to the sandblasted finish.

Ramuc Utility Enamel, a glossy chlorinated rubber-base coating, was applied to the metal work. Although it was recommended that the previous finish be removed, two coats were applied directly over the existing paint after light wire-brushing, to save time and labor. The paint went on smoothly, and remains in good condition after almost three years' time.

Other Examples

Among many other case histories which might be cited are the East Side and West Side sewage treatment plants of the city of Bridgeport, Conn. Both plants are painted throughout with chlorinated rubber-based finishes. Ramuc Utility enamel is used for protecting non-submerged steel, concrete, and masonry. Attractive light colors protect and beautify walls, ceilings, and floors—they remain colorfast under strong cleaners. The bright appearance of an operating floor in the West Side plant is evident in Fig. 7.

The new North Side sewage treatment plant at Joplin, Mo., is also painted throughout with chlorinated rubber-based finishes. No peeling, blistering, or fading of coatings has been evident. These finishes were selected because of their proven ability to resist difficult conditions.

Novel Use of an Electronic Locator

A New Orleans Marine Insurance Underwriter, the George S. Kausler, Ltd., report an interesting use recently made of an electronic Pipe Line Locator in the location of submerged pipe.

A valuable shipment of pipe shifted on a barge and was lost in the Gulf three miles off-shore at Corpus Christi, Texas, in thirty-four feet of water. Despite the fact that salt water dissipates the effectiveness of most electronic locating devices, a Wilkinson Line Locator was mounted on the prow of a wooden skiff which was rowed over the suspected area. The instrument registered the presence of the pipe scattered in several piles over a distance of about two hundred and fifty yards. When this simple preliminary spotting was done, a diver verified the locator's findings. Later $16,000 worth of pipe was recovered.

It is also reported that the Kausler Co. had earlier made effective use of their electronic Line Locator to recover tools and equipment lost in the Ohio and Mississippi Rivers.

Fundamental Principles of Handling Chlorine

I—Chlorine Packages

by **V. W. LANGWORTHY**, *Research Chemist, The Chlorine Institute, Inc., New York*

Chlorine is a widely used tool in the treatment of water, sewage, and industrial wastes. Fundamental knowledge of handling this tool is important because of its potentially hazardous characteristics.

In this series of articles on handling chlorine, Mr. Langworthy summarizes useful information and describes good practices. Each article has been designed to be of practical value to all users of chlorine.

LIQUID chlorine was introduced as an article of commerce in 1909, and developments in its handling and application have progressed steadily. Caution has been the watchword, with careful attention being paid to the lessons learned through numerous valuable, and sometimes bitter, experiences.

It is the purpose of this series to delineate, in a practical way, the present day handling techniques which use equipment evolved from cautious advancement in the art of chlorination.

Chlorine Packing Units

Anhydrous liquid chlorine is available in packages of several sizes, all of which are pressure vessels of steel construction and are equipped with safety devices. Loaded packages have about 12 per cent gas space at 68° F, to allow expansion of the liquid contents when exposed to higher temperatures. Internal inspection of returned packages is routine: outlet valves are removed and overhauled after each trip and all packages are pressure-tested at regular intervals.

Chlorine Cylinders

Consumers of chlorine used for sanitation are familiar with 100 lb., 105 lb. and 150 lb. packages, properly referred to as cylinders. The Interstate Commerce Commission specification number, serial number, producer's insignia, date of last hydrostatic pressure test and the tare weight are stamped into the shoulder of each cylinder.

Cylinder valves have brass bodies and Monel metal stems; these valves have been standardized by The Chlorine Institute, Inc. Each chlorine cylinder valve is equipped with a fusible plug safety device designed to melt between 158° F. and 165° F. (Fig. 1).

Chlorine cylinders, empty or full, should never be dropped or permitted to strike each other with any force.

Ton Containers

Liquid chlorine is also available in one-ton packages, properly referred to as ton containers. The Interstate Commerce Commission specification number, serial number, producer's insignia, date of last hydrostatic pressure test, water capacity and tare weight appear on each container.

Each ton container is equipped with two Chlorine Institute standard ton container valves (Fig. 2). Valves for ton containers are *similar* to the valves used in cylinders, but they differ in that ton container valves have a larger internal hole and *do not* have a fusible plug safety device (Fig. 3). Safety precautions for ton containers are observed by utilizing six fusible plugs per container. Three plugs are located in each end of a container, spaced 120° apart. The fusible metal has been designed to soften or melt at a temperature between 158° F. and 165° F.

Chlorine containers, empty or full, should never be dropped or permitted to strike each other with any force.

Tank Cars

The largest common chlorine shipping packages are single unit railroad tank cars of three different capacities: 16, 30 and 55 tons. These consist of a steel tank, four inches of cork insulation and an outer steel shell. Four angle valves are located in a dome centered on the top of the car. The valves are constructed of forged steel, with Monel stems and seats (Fig 4). Outlet threads of the valves are 1-inch female standard tapered pipe threads. Tank cars have a spring loaded safety valve located at the center of the dome. This device is gas

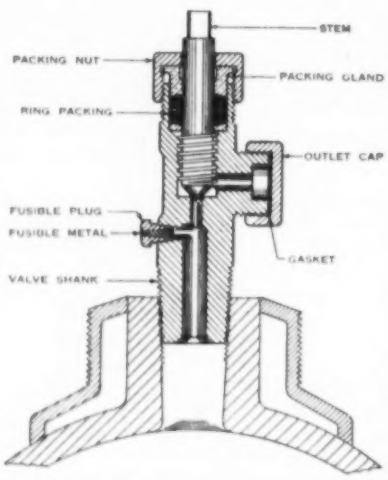


Fig. 1—CHLORINE cylinder valve
This is the Chlorine Institute standard cylinder valve with screwed type fusible metal plug. There is also a standard poured type plug.

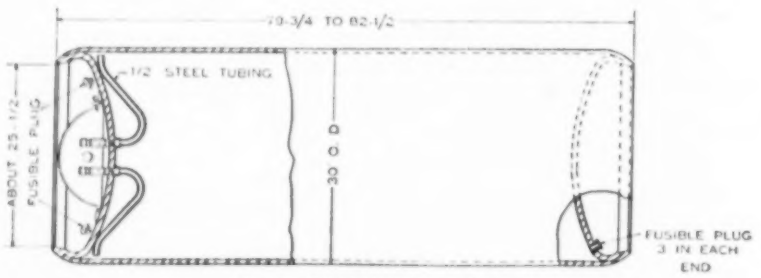


Fig. 2—CHLORINE ton container
The ton container is equipped with two valves connected to eduction pipes, and has three fusible metal plugs in each end.

tight at or below 180 lbs. pressure (gauge), and pops at 225 lbs.

Liquid chlorine is unloaded through the two angle valves located on the axial center line of the tank; eduction pipes leading to these valves are fitted with rising ball check valves designed to shut when the rate of flow of liquid chlorine is 7,000 to 8,000 pounds per hour.

Gaseous chlorine may be unloaded through two angle valves located at right angles to the length of the car (on 55 ton tank cars, one of these gas valves has been replaced with a second safety valve).

The U. S. Coast Guard has authorized the shipment of chlorine by tanks on barges especially designed for this service. A few producers make use of this means of conveying comparatively large quantities of liquid chlorine. This package has not been used in the sanitation field.

Handling Chlorine Cylinders
(100, 105 and 150 pound capacity)

Transportation of full and empty cylinders usually is accomplished by truck or rail shipment. In the interests of safety, unloading docks should be at truck or car bed level. Manhandling of cylinders is dangerous and use of hand trucks is recommended. The use of a well-designed hand truck, properly balanced, preferably with a clamp support at least two-thirds of the way up the cylinder, is considerably more economical than the consequences of a possibly fatal mishap (Fig. 5).

Cylinders should be stored in a cool place, in an upright condition, away from dampness, ventilators, elevators and walkways. Valve protection caps should be kept in place until immediately before use. Never lift cylinders by the cap, and do not use a lifting magnet or sling in handling cylinders. Cylinders should be used in the order they are received, since it is possible for old valve packing to become dry enough to permit escape of chlorine gas. It is desirable to support cylinders securely during chlorine withdrawal.

Connection to the cylinder valve outlet may be made by either a clamp-and-adapter (Figs. 6A and 6B) or a union connector (Fig. 6C). In either case, inspect the inner surfaces of the joining parts and always remove old gaskets and foreign material. When a full cylinder is connected, a new gasket of standard material should be used. Standard gasket materials are 3% antimony lead, or Garlock 900 or equivalent.

Open cylinder valves slowly: one complete turn of the stem in a counter-clockwise (left hand) direction opens the valve sufficiently to permit maximum discharge. Do not use a wrench longer than 6 inches for operating a cylinder valve. Leaks may be detected by holding an ammonia moistened cloth near all connections. When this is done, the presence of chlorine will be evident if a white cloud (ammonium chloride) is formed (Fig 7).

The practice of compounding cylinders (manifolding) to increase *gas* withdrawal rates entails increased caution when putting full cylinders in service. A good precaution to observe is a check of each outlet connection by partially opening and immediately closing the cylinder valve to insure that solid connections have been made.

Consumers removing *liquid* chlorine from cylinders are cautioned that manifolding cylinders for liquid chlorine withdrawal should NOT be attempted.

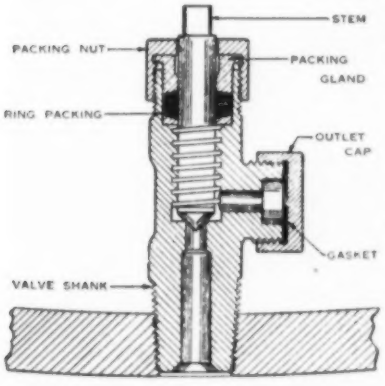


Fig. 3—CHLORINE ton container valve
This is the Chlorine Institute standard ton container valve; it has no fusible metal plug.

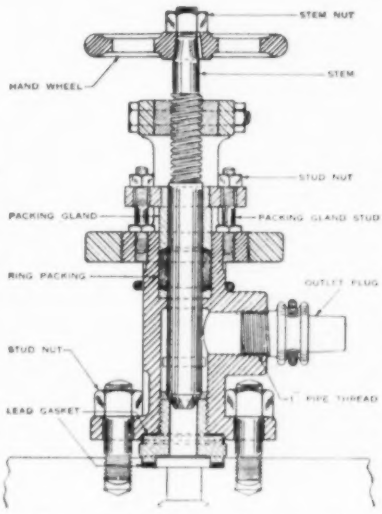


Fig. 4—CHLORINE angle valve for tank cars

Fig. 5—HAND TRUCK for chlorine cylinders
Note rubber tires and strap to secure the cylinder during movement.

Handling Chlorine Containers
(2,000 pound capacity)

Transportation of full and empty ton containers usually is accomplished by rail. The ton multi unit railroad tank car has been developed to meet the needs of consumers using chlorine in excess of 30 tons per year. The car consists of an underframe on which are mounted 15 detachable containers, each containing 2,000 lbs. of liquid chlorine. The car is classified as a tank car and freight is charged only on the 15 tons of liquid chlorine. The empty containers on returning underframes travel on a freight free movement. It is possible in certain locations to obtain ton containers via truck delivery.

The advantages of using chlorine from ton containers are well known: less handling, connecting and disconnecting. The fact does exist, however, that ton containers are bulky to handle. They may be handled safely, provided adequate equipment is available for unloading, storing, using and re-loading empty containers.

Unloading full containers may be accomplished by means of a specially designed lifting clamp* (Fig. 8). The clamp is used in combination with a hoist on a trolley or a jib boom. Ton containers which must be trucked from the siding to the storage area should be placed on saddles on the truck and clamped down to prevent shifting and rolling. Cradles should also be provided in the storage area,

*One source of supply for these clamps is Mansaver Industries, Inc., 3105 East St., New Haven, Conn.

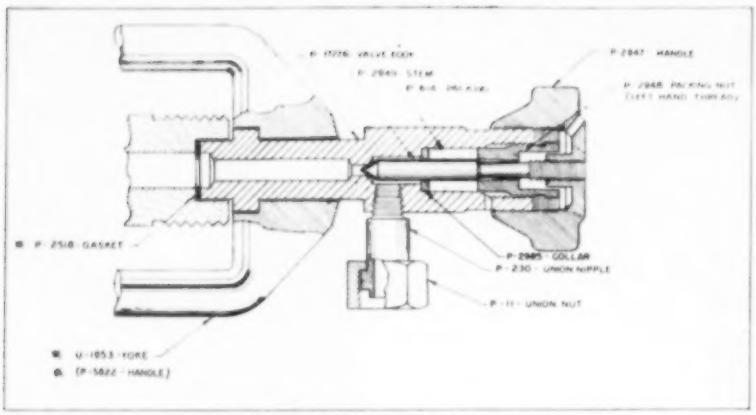


Fig. 6A—CYLINDER VALVE outlet connection
This is a clamp-and-adapter or yoke type connection of auxiliary valve to chlorine cylinder valve.

Fig. 6B—CONNECTION to cylinder valve
Note proper size of wrench (6-in. long) for tightening yoke clamp and operating cylinder valve.

with overhead hoisting equipment for transporting containers to and from the scale room (Fig. 9).

It is good practice to store ton containers in a cool place, away from dampness, ventilators, elevators and walkways. Containers should be stored on their sides, with valve protection hoods in place. Do not store chlorine containers in the vicinity of combustible or flammable materials.

As with chlorine cylinders, it is advisable to use full containers in the order they are received. *Never* tamper with fusible plug safety devices.

Connection to the proper container valve outlet may be made either by a clamp and adaptor or a union connector. The proper valve depends on whether liquid or gaseous chlorine is to be withdrawn (Fig. 10). Placement of the container on scales must be such that the two valves are positioned vertically. Thus, eduction pipes within the container will conduct liquid chlorine to the lower valve and gaseous chlorine to the upper valve.

In making connections, gasket surfaces should be thoroughly inspected and cleaned, a new gasket of standard material should be used for each connection. Outlet threads on the valves of containers are NOT tapered pipe threads. Make certain that the threads on the appliances and unions are the same as those on the outlet valves, and never force connections that do not fit.

When a firm connection has been made, open the container valve slowly, being alert for a possible chlorine leak. Never use a wrench longer than 6 inches for operating a container valve. It is usually possible to eliminate a gas leak around the valve stem by tightening the packing nut.

If the practice of compounding (manifolding) ton containers is followed, to increase withdrawal rates, increased vigilance must be observed in connecting and disconnecting.

When is the Chlorine Cylinder or Ton Container Empty?

Three observations are commonly employed to indicate that chlorine cylinders or ton containers are becoming empty. Loss in weight is the most dependable indicator of the amount of chlorine remaining in a cylinder or ton container.

Loss in Weight

Producers and prepackagers load precise weights of chlorine in the various packages, and tare weights are carefully checked. Therefore, scales used by consumers in conjunction with chlorine feeding should be in good operating condition. Close observation of weight loss should always be made, and this applies especially when approaching the point where a change to full packages must be made.

Pressure Drop

Two other indicators, while not as useful as loss in weight, do serve to warn that cylinders or ton containers are becoming empty. One is the observation that the gauge connected

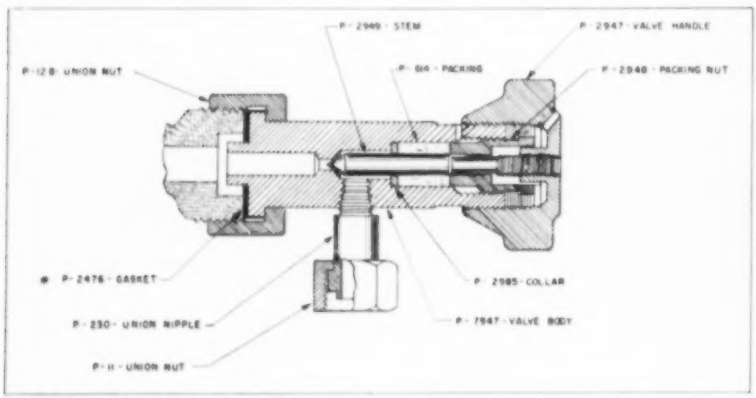


Fig. 6C—CYLINDER VALVE outlet connection
This is a union type connection of the auxiliary valve to the chlorine cylinder valve.

Fig. 7—TESTING for a chlorine leak
A cloth or swab moistened with ammonia is held near each connection in the chlorine gas line.

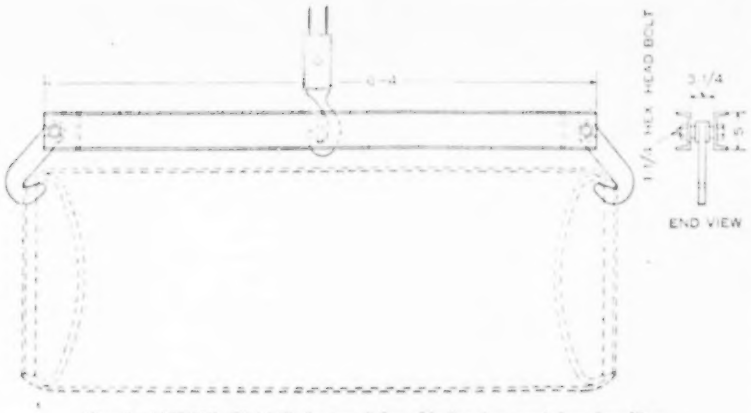


Fig. 8—LIFTING CLAMP designed for chlorine ton container handling

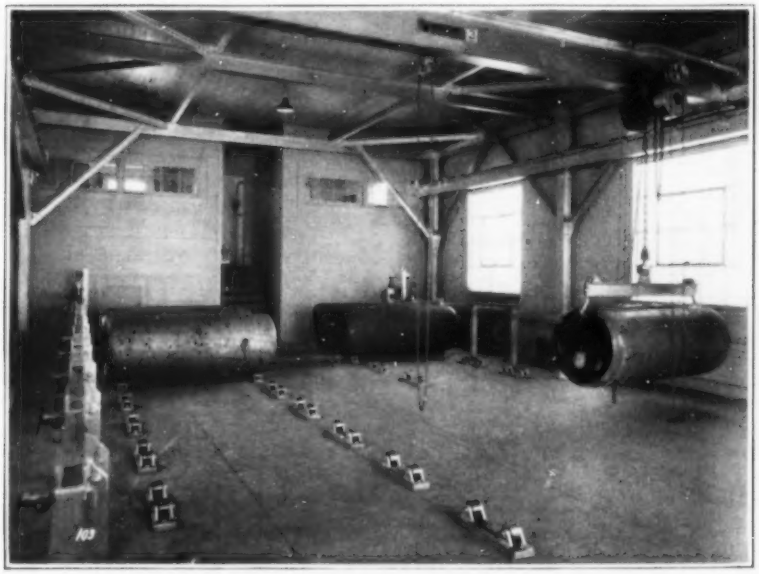


Fig. 9—STORAGE and handling facilities for chlorine ton containers
Lifting clamp is raised by overhead 3-ton hoist. Roller cradles facilitate positioning and connecting containers to discharge line.

to the chlorine gas transmission line shows a pressure drop, and the other is evidence of a vacuum break (sucking air) caused by lowering of pressure in the chlorine supply system.

Both of these indicators provide warning in advance of depletion of cylinder or container contents. Note that the chlorine gas pressure guage *does not* measure the volume of or weight chlorine remaining. Pressure exerted by confined chlorine gas depends on the temperature: theoretically, one pound of chlorine will, at a given temperature, exert as much pressure as will 2,000 pounds. It is emphasized that low readings of the chlorine pressure gauge merely indicate the probability of lowered tank contents.

Vacuum Loss

On chlorine feeders of the visible vacuum type, "bubbling" of air into the bell jar may indicate reduced pressure in the chlorine system. Depending on the feed rate, "bubbling" may proceed for varying lengths of time before a full cylinder or container must be placed in service. Chlorine feeders utilizing a rotometer, which measures gaseous chlorine flow, will perform in much the same manner, but rotometer readings will tend to drop off.

It will be noted that accuracy of chlorine dosage suffers when "bubbling" occurs or rotometer readings are unsteady. Changes to full chlorine cylinders or containers should be made promptly when this condition is coincident with loss of weight readings. It is obvious that economical usage precludes efforts to evacuate the last traces of gaseous chlorine from cylinders or containers.

Producers of liquid chlorine do completely evacuate chlorine from all returned packages. This is essential, because all cylinders, containers and tank cars are inspected internally prior to refilling. Another step includes removal, reconditioning and replacement of all chlorine valves.

Empty chlorine cylinders and ton containers should be removed from service immediately, tagged as empty and placed in a separate area to prevent possible confusion with full packages. Chlorine producers recommend prompt return of all empty packages as well as return of full packages considered to be in excess of adequate inventory.

Procedures involved in handling liquid chlorine differ from those in handling chlorine gas only insofar as vaporization is concerned. Liquid chlorine is withdrawn from the ton container through the lower outlet valve and is conducted to an evaporator of the type commercially available from equipment manufacturers. Vaporization of the chlorine is accomplished by heating within the evaporator. The gas is delivered to the metering equipment under constant temperature and pressure. Visual or orifice type flow meters may be employed, with or without recording equipment.

Handling Single Unit Tank Cars (16, 30 and 55 tons)

The necessity for caution in handling tank cars containing chlorine has long been recognized by the producers and by the Interstate Com-

Fig. 10—CONNECTED chlorine ton container
Gaseous chlorine is withdrawn from the upper valve. See Fig. 2 also.

Fig. 11—TANK CAR angle valve connected to deliver liquid chlorine
The angle valve (see Fig. 4) is located inside car dome; pipe wrench is to be no longer than 18 inches. Discharge line has flexible loop at car end.

merce Commission. Accordingly, those concerned with safe handling of the several tank car sizes must observe requirements which appear in sections of Agent H. A. Campbell's Freight Tariff No. 8.* Full legal requirements which must be met in unloading chlorine tank cars may be found in Sections No. 74.560 through No. 74.563 of Freight Tariff No. 8.

In addition to compliance with I.C.C. regulations the consumer, in order to assure maximum safety, should familiarize himself and his employees with the general recommendations of his chlorine supplier. Helpful suggestions are contained in technical service department chlorine bulletins, The Chlorine Manual** and published reports from operators experienced in tank car handling.

Typical of the legal requirements which must be met in order to unload chlorine from single unit tank cars is the necessity for a consumer to: acquire a private railroad siding; allow only reliable persons properly instructed and made responsible for compliance with regulations to perform unloading operations; place caution signs so as to warn of the operation in progress; detach unloading lines wherever unloading operations are suspended; have the car attended by a responsible person whenever the car is connected to an unloading device; be sure that complete unloading is followed by tightening all valves, removal of unloading connections and tightening of all other closures.

Producers have made general recommendations which amplify the legal requirements and provide further techniques in safe handling of tank car chlorine. Typical of these recommendations are: the derail protection of cars being unloaded; limit to 18 inches of the pipe screwed into a tank car discharge valve; use of a pipe wrench no longer than 18 inches in making tank car connections; provision of a flexible arrangement at the tank car end of the discharge line; use for chlorine service of extra heavy black iron or steel pipe with clean, sharp threads; painting of chlorine piping a distinctive color (yellow is most common) to guard against mistakes in identifying pipe lines; and provision of approved gas masks for emergency use.

The legal requirements and general recommendations cited are admittedly incomplete, the intention being to suggest that many precautions must be taken in handling single unit tank cars —and additional procedures are required to limit sources of potential hazard. Fig. 11 illustrates details of a connection being made to a single unit chlorine tank car at a sewage treatment plant.

Summary

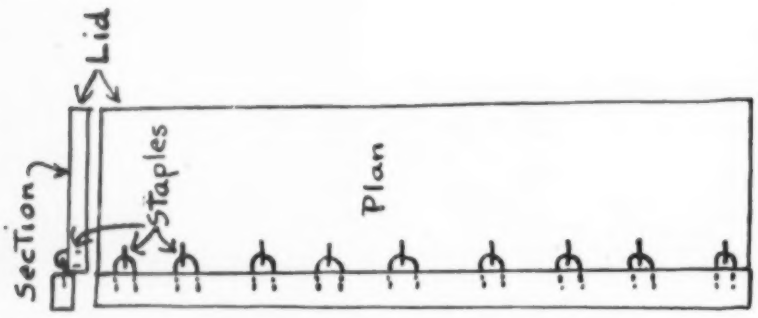
Packages containing liquid chlorine must be treated with the respect which they deserve, in order to insure safety. It might be said that experience, not personal, but the type learned from others, is the best teacher of proper procedures to follow in handling chlorine.

Acknowledgments

The author wishes to acknowledge assistance from technical service department bulletins issued by the chlorine producers, previously published articles on the subject and those equipment manufacturers who cooperated in supplying appropriate photographs and technical advice.

*Issued by H. A. Campbell, Agent, Bureau of Explosives, 30 Vesy Street, New York 7, N.Y.

**Copies are available from The Chlorine Institute, Inc., 50 East 41st St., New York 17, N.Y.



An Emergency Hinge*

Every reader has doubtless been in need of a hinge of some kind at one time or another, but didn't have one, and so made one out of a strap of leather, canvas, or some such thing.

This sketch shows how to make a substantial emergency hinge out of ordinary staples. For instance if it is desired to hinge a board, as is generally is, drive two rows of staples—one row horizontally, and the other row vertically, through the "eyes" of the first driven row of staples. Drive the staples accurately, each the same distance into the wood and each carefully placed. A first class hinge will be the result. Use as many staples as may be needed to give the hinge its desired strength. It will not be the equal of a first class manufactured hinge, of course, but for an emergency job it usually serves very well.

*Contributed by W. F. Schaphorst, M.E., Newark, N.J.

REPORT FROM ABROAD

The Detergent Situation In England

Involving Politics, Personalities and Public Health.

And More About Micro-Strainers

After Twelve Months of Operation

by JOHN FINCH, *Manager, Sewage Disposal Department*
Rotherham, England

THE spectre of the whole comprehensive problem of the treatment of detergents in sewage and the influence of detergents upon rivers and streams, has once more raised its hoary head, and it would appear from a critical review of the facts so far presented that there is a fair possibility of an improvement in the present state of affairs. The coup-de-grace might conceivably occur in an aspect of the problem that has been instrumental in bringing the matter of detergents before the public eye—the problem of foaming.

The Detergent Bogy

That this would accomplish only a slight improvement in the present situation, which has been rapidly worsening, is accepted by all technicians in the field. The slight improvement may be brought about to some extent by the weight of public opinion. This is a point that should not be lost sight of, in view of the fact that the same public may, in due course, have to foot the bill in terms of hard cash and public amenities if the situation gets out of hand, as appears likely from certain points of view.

Politics

Such has been the public interest in the use of detergents and their effects on the rivers in the form of froth and foam (so much apparent these days) as to cause the following question to be put in the House of Commons on Thursday, November, 1952, by Sir Herbert Williams, Member of Parliament for South Croydon (London area) . . .

"To ask the Minister of Housing and Local Government whether his attention has been drawn to the fact that certain detergents are now having materials added to them which have the effect of producing permanent foam with a consequential prejudice to public health, and will he state what steps he is proposing to take under the Public Health Act to deal with the matter."

One firm of manufacturers of detergents has gone so far as to notify the public, through the medium of advertising, that the particular detergent manufactured by them gives little or no lather, and to point out ample evidence for the assertion that lather is entirely unnecessary.

This same firm in their sizable advertisement which appeared pretty well in all the daily and Sunday newspapers, put forward the plea on behalf of local authorities and public amenities that the appearance of foam on rivers and filter beds at sewage works has become a national problem. They go on to say that it is possible for this foam, etc., to leave a scum on the surface of the river waters which hinders or prevents oxygenation with the result that animalcula may die, the water often becomes foul and fish may either desert the streams and rivers or die.

Whether or no this advertisement and the opinions and facts stated in it will become the starting point in a competitive industrial campaign to boost the non-lathering properties of detergents—as well as the sales—and appeal to the housewives (always providing the housewives will co-operate) remains to be seen. Nevertheless the significant point which still remains when all is said and done, is that really efficient detergents apparently need not be "frothblowing" materials.

Mr. Finch's *Report from Abroad* will continue to present facts, observations and opinions of timely interest. The author is Chairman of the North Eastern Branch of the Institute of Sewage Purification, and is a frequent contributor to British technical journals. He will welcome the opportunity of replying personally to readers of *Water and Sewage Works* who have questions or require additional information regarding the subjects discussed.—The Editors.

Personalities

Furthermore, if the housewife can be re-educated to the use of a frothless detergent—and this may easily take a bit of doing—then the elimination of the "frothblowing" constituent will be one less undesirable feature of these materials, so far as sewage treatment is concerned. Incidentally, it is not always appreciated that the housewife has, in fact, been responsible for the frothing common to detergents and, of course, soaps. In the earliest days of soap manufacture, these materials were assessed on their ability to make lather—especially in hard-water areas—and a soap that did not make a very good lather did not perform the task of washing as well as the soap with the good creamy lather. Neither did it sell as well.

The brake has been applied, even if only with slight pressure, on this phase of detergent manufacture. Will the pressure be maintained, or perhaps be increased and stop this process of manufacture, or will "progress" merely burn-out the brake?

These are questions that every sewage works technician is asking himself right at the very moment, or at least at those moments when he is not involved in high-pressure technical lectures on detergents with his wife!

Public Health

At the recent Public Works Congress held in London, in a meeting

held under the auspices of the Institute of Sewage Purification, Mr. John Hurley presented a paper on "Some Experimental Work on the Effect of Synthetic Detergents on Sewage Treatment." The paper dealt with large scale experiments carried out at two sewage works of the Wolverhampton Corporation, on the effect of Teepol on sewage treatment processes. Teepol is a detergent of the secondary alkyl sulphate type.

Investigations were carried out on the treatment of sewage containing Teepol on biological filters and in the Haworth Bio-aeration plant. The results of reasonably long-term works-scale experiments showed that this detergent was easily assimilated both by the percolating filter and the activated sludge process of treatment. Furthermore, there were no foaming troubles. However, the author stressed that these findings must not be taken as applying to all the various types of detergents, some of which are known to be resistant to breakdown by biological processes at the sewage treatment plant.

Mr. Hurley states that little thought is needed to make plain the fact that the investigation of the whole problem of the treatment of detergents at the sewage works would need an immense amount of research work, and that brief consideration of the many possible points at which the effects of detergents may be felt is sufficient to demonstrate the wide field which requires this investigation.

However, this gives only a slight idea of the magnitude of the problem, and to get a true picture, it is also necessary to take account of the fact that there is a multitude of materials covered by the generic term "synthetic detergent." The composition and properties of these various materials differ enormously and it is already clear that it cannot be assumed that they will all have the same response to, or effect on, sewage purification processes.

The results so far obtained at Wolverhampton have indicated that Teepol, in concentrations in which it is likely to occur in sewage, will not have any marked effect on sewage purification processes. The possible effects of Teepol on sludge treatment has not been dealt with in the paper, but experimental work on this subject is being carried out. However, at the time of presenting the paper, progress has not reached a sufficiently advanced stage to justify any definite conclusions.

It is hoped that arrangements will be made to extend the experimental work at Wolverhampton to other types of detergents, and there is every indication that the Wolverhampton laboratories are likely to lead the way in investigations and researches into the whole subject of treatment of these materials at the sewage treatment plant.

In the discussion that took place after the presentation of Mr. Hurley's paper, Mr. C. B. Townend of the West Middlesex Main Drainage scheme, expressed concern at the present and prospective effects of some types of detergents on sewage and sewage treatment processes. He stated that unless some measures of control could be devised, it seemed possible that detergents of some types would be used which would completely incapacitate the present biological methods of sewage treatment, to which we possessed as yet no effective alternative treatment.

The problem, he said, must be solved at the source—everyone agrees heartily with this statement—and manufacturers should be restricted to the manufacture of those types of detergents which would not prove to be unduly troublesome to the various sewage treatment processes.

What is the Solution?

As one authority has put it, superadvertising campaigns for synthetic

Courtesy of N.Y.C. Pub. Wks. Dept.

IN THE U.S. also, presence and behavior of detergents in sewage receives increasing study

This photo in the lalobratory of the Jamaica Sewage Treatment Works of New York City shows analyst testing for determents

detergents have been super-successful, and the results have been a boon for the housewife, as well as producing large profits for the manufacturers. These same advertising campaigns have, however, produced a headache for the sewage treatment authority and the river authority, who have to deal with the banks of foam which have appeared.

The question now is: will the manufacturers after spending enormous sums advertising the wonderful lathering properties of their products, be prepared to modify them? The Minister of Housing and Local Government has called a meeting of sewage treatment authorities and the manufacturers of detergents. If the manufacturers are prepared to make concessions in the matter, well here is their opportunity. Only time can tell!

There is the additional possibility in this country that eventually the Water Pollution Research Board of the Department of Scientific & Industrial Research may take a hand in the investigations into the treatment of detergents. This organization is of course the ideal set-up for the job, and it would appear that at the moment the only difficulties are those concerned with shortage of staff. It is very sincerely hoped that these difficulties will be overcome in the near future in the interest of sewage treatment and, more important still, public health.

Micro-strainers at Luton

The results of the investigations carried out at the Luton Sewage Works on the operation of sand filtration and micro-straining plants as recorded by Messrs. Evans and Roberts, respectively Manager and Chemist, have produced a considerable amount of food for thought. Apart from troubles at the Luton plant associated with detergents, there are these troubles associated with suspended solids in the settled filter effluent.

The authors state that the link between an acceptable raw water for water works purposes and a conventionally acceptable sewage works effluent has been a comparatively unexplored territory, although some works with abundant capacity may go some way to bridge the gap. The Luton Corporation Sewage Works is, however, so situated geographically that it has been necessary to attain higher than normal sewage effluent quality. This required the works to discharge an effluent that was capable, without dilution, of providing an acceptable river water, and circumstances made it necessary to do this with as little delay as possible. Experience showed after the new sewage works was brought into operation, that the discharge of an effluent containing an average content of suspended matter below the 30 ppm mark would still cause troubles in the water courses.

How to Strain Sewage

It was therefore decided that the attempt to produce an effluent of higher quality should be directed at a further reduction of the suspended matter content of the effluent, and it appeared probable that sand filters and micro-strainers could be adopted to obtain this objective.

Although the problem of inadequate dilution occurred in its most acute form at Luton, there were in the country several other large towns where a similar problem existed and, in consequence, the Water Pollution Research Board undertook to study the possibilities of using the plants for this purpose at both Luton and Coventry, and after some initial laboratory scale work, pilot sand filter plants were erected at Luton and Coventry, and a semi-scale micro-strainer lent by the manufacturers was operated at Luton.

Following this experimental work, Luton Corporation were satisfied that they were justified in installing sand filters and/or strainers as a method of improving the quality of the sewage effluent. The results showed that either was capable of effecting the substantial improvement required. After considering the relative merits of the two processes, it was decided to install a limited capacity of each type of plant, to treat approximately 3 mgd. In the case of the sand filter plant this volume was on the basis of 100 gal. per sq. ft. per hour; and in the case of the strainers it was based on use of the Mark 11 fabric of the experiments. It was found possible to use the sand filters at double the 100 gallon dose, and it was later decided to alter the micro-straining fabric to a finer Mark 11a gauze, calculated to treat rather less liquor but to produce a superior quality effluent. (Mark 11a stainless steel fabric has 100,000 orifices to the square inch of nominal diameter equal to 0.045 mm.)

Operating Results

A summary of twelve months experience with the treatment of Luton humus tank effluent through parallel units of rapid sand filtration and micro-straining shows that the plant has produced results comparable with those in the experimental units. The sand filters have reduced the suspended matter content of the effluent by 75%; biological oxygen demand by 52%; and the four hours permanganate absorption by 27%. The micro-strainers have effected a reduction in suspended matter of 66%, biological oxygen demand by 36%, and permanganate absorption by 20%.

It has been found that both plants require a good quality effluent as feed liquor in order to maintain a low suspended matter content of 5 ppm or less in the effluent; and in the case of the micro-strainer to maintain the rate of treatment.

It has been found that the capital cost per million gallons capacity is similar in the two plants, but that operational costs, including power, of the sand filters are greater. The higher costs in the case of the sand filters has been compensated by a better quality effluent, in which biological purification is to be found as well as suspended matter removal. The low dissolved oxygen of the sand filter effluent is a disadvantage, but it appears that the river picks up the necessary oxygen in very short time.

"Drift Cards" a New Technique to Trace Currents in Water

With the aid of the postman and residents of the Lake Erie area, an Ohio State University staff member has completed a research study on surface flow in the lake. James L. Verber of Ohio State's Stone Institute of Hydrobiology at Put-in-Bay, O., made use of "drift cards" to trace surface movements of lake waters. The numbered cards, sealed in plastic envelopes, were stamped and addressed to the Institute, then released in western Lake Erie over a two-year period.

Finders returned by mail about 30 per cent of the 3,200 cards dropped in the lake. One card traveled 230 miles; another was returned three years after being released. Flow information obtained in this manner indicated that surface currents in Lake Erie are controlled by wind alone.

Want to Feel Tired?

Every day—your heart beats 100,800 times; you inhale and then exhale 438 cu. ft. of air plus dust, moisture, smoke, and all.—Feel tired?

Syndets in Sewage Can Be Measured

Anionic Detergents Determined in 30 Minutes by Color Test

by SAMUEL D. FAUST, Chemist, W. A. Taylor & Co., Baltimore, Md.

MANY sewage plant operators have recently reported difficulties in the treatment of sewages containing synthetic detergents. Excessive foaming and inefficient settling seem to be the most common problems caused by these compounds.

There are three categories of detergents: anionic, cationic, and nonionic. Only the anionic need be considered as affecting sewage treatment plant operation because the use of anionic detergents far exceeds any others.

The fatty acid soaps are included as anionic surface active compounds. However the reaction of soap with the calcium and magnesium present in sewage will render it harmless as its detergent properties are destroyed through the formation of an insoluble precipitate. These spent soaps may rise as scum or settle as sludge.

Since synthetic detergents are not affected by calcium and magnesium, nothing in the sewage will cause them to lose their power of detergency. If the detergent concentration is high enough, the sewage solids may tend to remain in suspension. Lowered surface tension of the sewage results in the formation of foam whenever aeration is employed as described by Keefer.

How to Measure Syndets

With the ever increasing use of synthetic detergents by the public, the need has developed for a simple, reasonably accurate, chlorimetric method for the determination of these compounds. Such a test should be one that a sewage plant operator can easily manipulate. For this purpose, the photometric method described by J. H. Jones has been adapted to the Taylor comparator. According to Jones, "It has been found that 'sulfated' or 'sulfonated' surface active compounds form colored salts with methylene blue. The reaction appears to be:

$$\underset{\text{anion}}{RSO_4^-} + \underset{\text{cation}}{MB^+} \rightarrow \underset{\text{blue colored salt}}{RSO_4\,MB}$$

These colored salts are soluble in chloroform and under suitable conditions can be quantitatively extracted from an aqueous solution without extraction of any uncombined methylene blue. The amount of surface active compound may, therefore, be calculated from the concentration of the colored salt in the chloroform."

Sewage wastes contain numerous anionic detergents each with a different molecular weight. It was necessary to select as a basic standard a compound whose weight was considered average. Molecular weights of the commercial products tend to concentrate around 250 to 350. We chose sodium lauryl sulfate as the standard because it has a molecular weight of 288 and is available in a pure form. Standard solutions of the sulfate were extracted and the resulting colors were matched by varying the intensity of a stable blue inorganic salt solution. The concentration of anionic detergents varies directly with the color; therefore, as the concentration increases the color increases.

Reagents and Equipment

Reagents for the colorimetric test are: aqueous methylene blue indicator solution, chloroform USP, and concentrated hydrochloric acid. The determination is carried out with a 50 ml graduate, a 10 ml test tube, two separatory funnels (A & B), a glass funnel, a glass stoppered bottle graduated with a 50 ml mark, three 5 ml test tubes, a comparator base and a color standard slide containing standards representing 0, 1, 2, 3, 4, 5, 6, 8, and 10 parts per million of syndet (synthetic detergent).

Procedure

A 10 ml sample of the material being tested is measured with the 10 ml test tube and placed in separatory funnel A. To it is added 10 ml of distilled water and five drops of concentrated hydrochloric acid. After mixing, one milliliter of methylene blue solution is added and the contents of the funnel are thoroughly mixed. To the resulting mixture is added 20 ml of chloroform.

The separatory funnel is shaken gently for one minute and then allowed to stand for five minutes. The chloroform (bottom) layer is then drained into separatory funnel B and 20 ml of distilled water is added.

Separatory funnel B is shaken gently for one minute and then allowed to stand for five minutes. The chloroform layer from B is then filtered into the glass stoppered bottle through a plug of cotton placed in the glass funnel. The wash water from B is then discarded as this removes the uncombined methylene blue that has been extracted by the chloroform.

To the treated original sample remaining in separatory funnel A is added an additional 10 ml of chloroform. The funnel is shaken gently for one minute and allowed to stand five minutes. The chloroform (bottom) layer is drained into B and 10 ml of distilled water added. After gently shaking for one minute and allowing to stand for five minutes, the chloroform (bottom) layer is passed through the same cotton filter into the glass stoppered bottle.

The operation outlined in the previous paragraph is repeated. Chloroform extractions now total three, one 20 ml and two 10 ml. The funnel and cotton are washed with a small amount of chloroform which is collected in the glass stoppered bottle. The extract is then made up by adding more chloroform to exactly 50 ml in the glass stoppered bottle and is mixed well.

Compare Color With Standards

A dry 5 ml test tube is filled with the blue chloroform solution and placed in the middle hole back of the slots in the bottom of the comparator base. Two other 5 ml test tubes are filled with clear colorless water and placed in the remaining two holes back of the slots in the base.

The color standard slide is placed on the base and holding the instrument toward a source of daylight, the slide is moved in front of the test sample until a match is obtained. The concentration in parts per million of syndet (anionic surface active compound) is then read directly from the values on the slide.

For accurate results the reading should be taken as soon as the extraction and washing procedure is completed. The chloroform solution will decompose in time due to the action of light. The time required to make a complete test is twenty to thirty minutes.

Development of Test

In order to perfect this procedure, it was necessary to extract solutions of numerous commercially available detergents. These compounds can be

subdivided into several groups. Among those studied are:

1. alkyl sulfates: Dreft, DuPont MP 189
2. alkyl sulfonates: Aerosol MA, IB, OT, AY
3. alkyl aryl sulfonates: Ultrawet K, DS, SK bead; Vel
4. alcolol sulfates: DuPonol 80, LS paste, Sufanole FAA
5. amine salt alkyl aryl sulfonate: Sulfanole KA
6. alkyl aryl poly ether sulfate: Triton 771
7. alkyl aryl poly ether sulfonate: Triton X-200

All these commercial detergents were found to react with methylene blue. Accurate data were difficult to obtain because of the use of extenders (such as sodium sulfate), uncertain molecular weights, unknown concentrations of the detergent, etc. However our main purpose was to determine whether or not the colorimetric test could be used over a wide range of compounds. Our conclusion is that the procedure developed is sufficiently accurate for sewage determinations.

Practical Tests on Sewage

Samples of sewage were obtained from several treatment plants and were examined for detergent content as noted in table I. They were submitted both from plants where difficulties are being experienced and from plants having no noticeable trouble.

It may be noted that the test results on samples from Baltimore's Back River Plant correspond very closely to those reported by Keefer. The accuracy of the colorimetric method was verified by taking a 50 ml sample of the trickling filter effluent containing 1 ppm of syndets and evaporating over a steam bath to 25 ml. Extraction was made and a reading of 2 ppm was obtained. Also, known amounts of sodium lauryl sulfate were added to a final effluent sample containing only a trace of detergent. Proper dilutions by adding effluent give to concentrations of 1, 5 and 8 ppm subsequently were verified by extractions.

TAYLOR outfit for determination of synthetic detergents in sewage
Color comparator, glassware, and reagents required in 30 min. test

Additional work is being done at the Hagerstown Disposal Plant under the supervision of Mr. Don Croft. Studies there are correlating the detergent content of sewage to time and rate of flow.

Moderate variations in the amount of methylene blue solution and of wash water has negligible effect on recovery. Enough methylene blue must be used to combine with all the syndet, and the solution in the first funnel must be acid in order to prevent the extraction of methylene blue base which would produce a violet solution in chloroform. The indicator is slightly soluble in chloroform, but a single washing always reduces the blank to a low value. The stability of the indicator solution has been checked over a period of a year, and the indicator was found to be stable if kept in a tightly stoppered bottle.

Basically the syndet comparator consists of a plastic slide housing the permanent standards which are guaranteed against fading and a Taylor pH base to hold the extracted sample for comparison. Reagents, glassware, and a source of artificial daylight are supplied. Principal advantages of the method lie in the simplicity of operation, saving of time and labor, and low cost.

Table I
SYNDETS IN SEWAGE
As Measured by Colorimetric Test

Plant	Raw Sewage	Primary Tank Effluent	Trickling Filter Effluent	Final Effluent
Baltimore, Md.	1.5 ppm	1.0 ppm	1.0 ppm	—
Towson, Md.	4.0 ppm	2.5 ppm	1.0 ppm	—
Hagerstown, Md.	2.75 ppm	2.5 ppm	—	1.5 ppm
Bridgeton, N.J.	2.0 ppm	—	—	—
Collingswood, N.J.	4.0 ppm	2.5 ppm	—	1.8 ppm
Barrington, N.J.	7.0 ppm	—	—	3.0 ppm
Gloucester City, N.J.	1.8 ppm	—	1.0 ppm	—
Westmont, N.J.	5.8 ppm	—	—	—
Woodbury, N.J.	3.2 ppm	—	—	—

Acknowledgement

W. A. Taylor & Co. wishes to express their appreciation to all who contributed to the development of this equipment; and especially to Mr. C. E. Keefer, Deputy Sewerage Engineer, Baltimore, Md., who brought the problem to our attention. We wish to thank the manufacturers who supplied experimental samples of various anionic detergents and the plant personnel who provided sewage samples.

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SEWAGE WORKS PRACTICES

OPERATION • MAINTENANCE • MANAGEMENT

Organic Solids in Sewage

The Third of a Series

by **DON E. BLOODGOOD**, *Professor of Sanitary Engineering*
Purdue University, Lafayette, Ind.

IN sewage treatment processes many of the solids removed are those that will burn when placed in a furnace. These combustible solids are those which may cause odor nuisances if they decompose in an uncontrolled manner. They are termed *volatile* solids, and are usually found in one of three classifications, known as carbohydrates, proteins, and fats.

Carbohydrates

The carbohydrates are chiefly derived from plant growth and they are made up of carbon, hydrogen and oxygen. Examples of carbohydrates are: fruit sugars, cane sugar, starch and cellulose. The sugars are sometimes given the names dextrose, lactose, maltose, sucrose, glucose, pentose, fruitose, etc. Although starch and cellulose appear to be quite different from the sugars, they all contain the same three elements—carbon, hydrogen, and oxygen. A general formula for a carbohydrate is $C_x(H_2O)_y$. (Values for x and y in this formula may be different for different carbohydrates.) The specific formula for sucrose (cane sugar) is $C_{12}H_{22}O_{11}$ and that for starch is $(C_6H_{10}O_5)_n$. It can be seen that carbon (C) is a common constituent of all of the carbohydrates previously listed.

Proteins

The organic compounds called proteins are composed of the elements carbon, hydrogen, oxygen, nitrogen and sulphur. Proteins are found in animal flesh and in some plants. Navy beans contain protein, as do soy beans and some of the other grains. Proteins are sometimes called nitrogenous compounds but they contain more carbon than nitrogen. Proteins in general are made up of elements in the percentages shown in the following tabulation:

Element	*Concentration in Proteins*
Carbon	50-55%
Hydrogen	6-8%
Nitrogen	15-19%
Oxygen	19-24%
Sulphur	0.5-2.5%

The albumin or white of egg is protein. The proteins are more complex substances and are thought to be harder to decompose or digest than are the carbohydrates.

Fats

The fats are organic compounds that contain carbon, hydrogen, and oxygen as do the carbohydrates. The elements in fats are combined in different percentages than they are in carbohydrates and this accounts for the difference in characteristics in the two types of compounds. There are slight differences in the chemical formulas of the fats known as tallow, lard, lanolin and others.

Some organic compounds contain mineral salts in small quantities. The quantity of mineral salts present does not increase or decrease when an organic compound undergoes decomposition.

Carbon Cycle

When a plant or animal dies, the breakdown of the tissues starts with the formation of simpler compounds and elements. The breaking down of carbohydrates, proteins and fats by bacteria is known as *decay* if the decomposition takes place in the presence of atmospheric oxygen. If the decomposition takes place in the absence of oxygen the process is termed *putrefaction* or *fermentation*.

The paths of the elements can be traced through the growth and decomposition of organic matter. Three of the common elements traced through the cycles are carbon, nitrogen and sulphur. The understanding of these three cycles can be very helpful to anyone confronted with the problems encountered in operating a sewage treatment plant.

The carbon in the carbohydrate, protein or fat of a dead plant or animal becomes the carbon in the carbon dioxide or methane gas formed when the particular compound undergoes decay, fermentation or putrefaction. These are processes that take place in trickling filters, activated sludge aeration tanks or sewage sludge digestion tanks. It is this part of the carbon cycle in which the sewage plant operator has a particular interest.

The carbon of the carbon dioxide is taken in by green plants and is used by the green substance (chlorophyl) in the leaves, together with energy from the sun, to produce carbohydrates, fats and proteins in plants. The plant carbohydrates, fats and proteins may undergo decomposition or they may be used by animals as food and the carbon changed into animal proteins or fats.

In the life of an animal some of the food that they have taken in may be used to supply energy. In this latter case, the carbon is expelled in breathing as carbon dioxide. With the death of plants and animals the cycling of the carbon starts over again. It is possible to follow the movement of carbon through the

In this series, Professor Bloodgood discusses *Sewage Works Practices* in the form of simple short course lectures. Each article is designed to interest and assist plant operators, students, and all who wish to review fundaments in this field.—The Editors

different states just described by studying Fig. 1.

Nitrogen Cycle

In following nitrogen through its various changes of combination it is to be remembered that the organic compounds involved are proteins. Dead plants and animals containing nitrogen undergo decay or putrefaction with the formation of ammonia. This action may be expected to take place in: sewers leading to a treatment works, the trickling filter, the activated sludge plant or the sludge digestion tank. The ammonia is not stable and can be used by some bacteria as food. These bacteria are commonly called nitrifiers: in the process of nitrification, they form nitrites by adding oxygen to the nitrogen. The nitrites are not entirely stable, and they can be converted into nitrates by other bacteria.

Not all nitrogen in proteins in sewage is converted to nitrate nitrogen in the process of sewage treatment. In general, however, the higher the nitrate content in a sewage plant effluent the higher the degree of treatment has been. When there is a nitrate content of 4 or 5 ppm present in a sewage plant effluent, an operator can be reasonably sure that most of the carbon either from carbohydrates or protein has been converted to carbon dioxide. The nitrate and nitrite formation usually take place in trickling filters or activated sludge aeration tanks.

The nitrate content of treated sewage in a secondary settling tank may be acted upon by certain bacteria, especially when there is a deficiency of oxygen in the sewage near the bottom of the tank. If this action occurs, the oxygen is taken away from the nitrate and the nitrogen is released as minute bubbles. The bubbles rise to the top of the secondary settling tank, carrying with them to the surface secondary settling tank sludge. The process of releasing the oxygen from the nitrogen is called denitrification.

Plants use nitrogen as a food and they can use it particularly well when it is in the form of nitrate. A secondary settling tank in which long streamers of algae grow can be expected to be handling an effluent containing considerable nitrate. The algae is plant life and the nitrate is a food for it. A stream receiving a sewage plant effluent containing nitrates can be expected to support an abundant growth of algae and larger water plants.

Sewage sludge contains nitrogenous compounds that undergo decomposition after being placed on soil to serve as fertilizer. The process of decomposition taking place in the open air releases the nitrogen as nitrates that can be used as plant food.

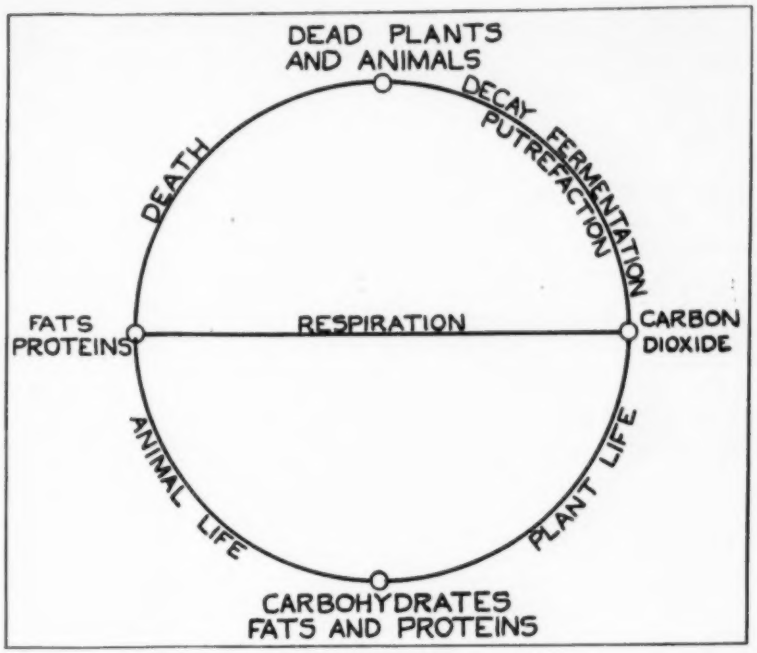

Fig. 1—CARBON CYCLE diagram

Some plants, known as legumes, can take nitrogen from the air and store it on their roots when they are assisted by certain bacteria. This process is known as nitrogen fixation. Animals eat the plants and convert those containing plant protein nitrogent into animal proteins or digest the plant proteins to obtain energy.

In the life processes of animals (and this includes humans) products of digestion are excreted as body wastes. These wastes comprise an important part of municipal sewage which, as a result, includes nitrogen compounds from fecal matter and urine. The urea in urine changes very quickly into ammonia when it is diluted with water.

Upon the death of animals the proteins of their bodies start again on the cycle. Nitrogen may be followed through the sewage plant by making analytical tests that tell the quantity of nitrogen present at a given point and, also, what stage in the nitrogen cycle it has reached. Fig. 2 shows diagrammatically a simple nitrogen cycle.

Sulphur Cycle

The cycle that sulphur makes in going from a protein through decomposition and reconstruction back into a protein is of importance in the handling and treating of sewage. This is especially important inasmuch as compounds containing sulphur are responsible for most odor complaints.

In the putrefraction of a protein, hydrogen sulphide is released and the characteristic rotten egg odor of this compound is not easily mistaken. Many bad odors are from sulphur-containing organic compounds. If the process of decomposition of a sulphur compound (such as a protein) goes on in the presence of oxygen, hydrogen sulphide will not be formed and the sulphur will be oxidized to sulphates without odor nuisance. The understanding of this particular part of the sulphur cycle makes it possible for a sewage plant operator to know what should be done if he is confronted with a hydrogen sulphide odor problem.

The sulphates are used by plants as food and are converted by plants into plant proteins. The plant proteins are utilized by animals, and are converted by animals into animal proteins or the sulphur passes off as wastes from animals. In either event it starts through the cycle again. A simple sulphur cycle is shown in Fig. 3.

Mineral Salts

There are a few mineral salts in many of the organic compounds. They are not increased or decreased in amount by any of the processes of biological decomposition. The percentage of these salts may appear to change but the explanation for this is that some of the carbon, hydrogen, oxygen, nitrogen or sulphur has been

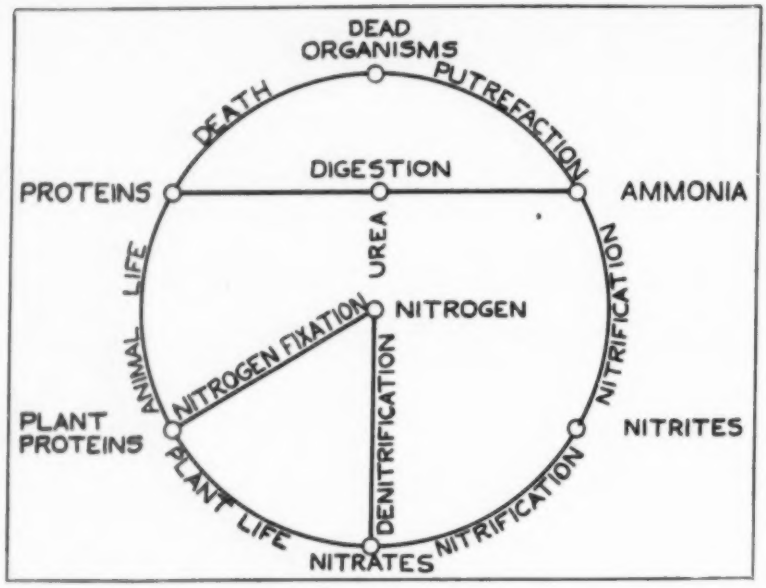

Fig. 2—NITROGEN CYCLE diagram

released from the organic compound so that the mineral salts are in higher concentration but not increased in total amount.

Organic Sewage Constituents

Carbohydrates in Sewage

There are many carbohydrates or carbonaceous compounds in sewage. Some of them come from parts of fecal matter, and others from the juices of vegetables and from particles of food lost in dish washing or the preparation of vegetables or fruits. The vegetable juices may contain starches or sugars. Large qauntities of carbohydrate compounds are lost in some industrial processes. The starch, brewing and distilling industries are examples of industries processing carbohydrates. Cellulose is a carbohydrate and appreciable amounts of it are known to be in sewage. Some of the more common sources of it are vegetables, toilet paper, and wastes from pulp and paper mills.

Not all carbohydrates are decomposed with equal ease by bacteria. It has been observed that celluloses decompose much slower than the starches and sugars and that it takes bacteria longer to decompose starch than to decompose sugar. This seems strange inasmuch as all of these compounds contain the same elements. An explanation is that the molecules forming the more difficulty decomposed compounds are structurally stronger than the easily decomposed materials. It is known that cellulose does decompose, because if it did not the earth's surface, wherever plants grow, would be piled high with it.

It is very difficult to make chemical analyses for celluloses, starches or sugars so there is little available information about the concentration of these substances in sewages. It is not easy to determine the carbon content of sewage. Therefore, because it is difficult to make analyses for carbon or to differentiate between the different carbohydrates and because there are varying degrees of difficultness in the bacterial decomposition of carbohydrates it has been necessary to develop a test that would measure the rate of decomposition of organic matter and at the same time give some idea about the amount of organic matter present. Tests devised for the purpose are: biochemical oxygen demand test and oxygen consumed tests.

Proteins in Sewage

There are numerous proteins in sewage, some of them originating from fecal matter and urine in sewage. Others have been discharged in the processing of foods. There are proteins in blood and milk so that any industry processing these or like compounds contribute protein wastes to the sewage.

There are hundreds and perhaps thousands of different proteins; they all contain similar but not identical proportions of carbon, hydrogen, oxygen, nitrogen and sulphur. Not much attention has as yet been given to the rates of decomposition of different proteins. It is known, however, that in mixtures of carbohydrates and proteins the carbohydrates decompose before the proteins.

It is almost as difficult to determine the amount and kind of protein in sewage as it is to identify by analysis a particular carbohydrate. It is, however, possible to determine organic nitrogen quite easily and, inasmuch as most proteins contain about the same percentage (17 per cent) of nitrogen, knowing the organic nitrogen content of a sewage it is possible to estimate the protein in a sewage with considerable accuracy.

Fats in Sewage

The fats in sewage come from fecal matter, soaps and food processing. The fats should not be confused with

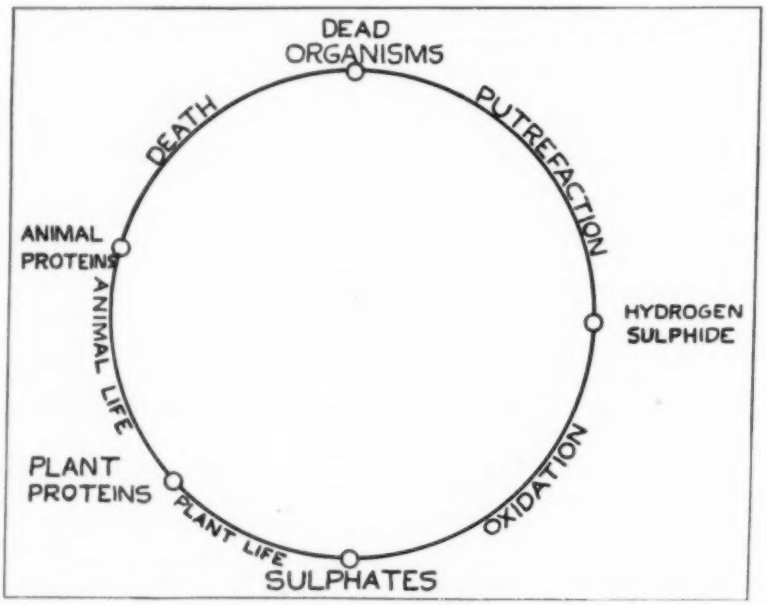

Fig. 3—SULPHUR CYCLE diagram

inert mineral oils and greases. The fats can be broken down by bacteria and used as food. The fats require more oxygen per pound of fat decomposed than do proteins or carbohydrates. It is easier to determine the fat content of sewage than it is to make an analysis for a carbohydrate or sugar.

Summary

The organic or volatile solids in sewage differ in chemical composition. Those that are acted upon by microorganisms decompose at different rates. These solids may require different amounts of oxygen to oxidize them into inoffensive compounds.

NEW WATER & SEWAGE REPORTS

Methods for Treating Metal-Finishing Wastes. Prepared by the Metal-Finishing Industry Action Comm., Ohio River Valley Sanitation Commission (Headquarters: 414 Walnut St., Cincinnati 2, Ohio). Copies of this manual, priced at $2.00 may be obtained from the Commission.

This is the latest manual in the industrial waste series being published by ORSANCO, and it meets the high standard set by prior publications. Its 72 illustrated pages describes the process best suited for a company to follow in solving problems of waste treatment. The text presents techniques, reactions, and design data—and evaluates the advantages and weaknesses of each method.

As an example, ten methods of cyanide treatment are described and two methods are covered for the treatment of chromium. The disposal of wastes from metal-finishing operations are discussed under the headings of neutralization and precipitation, regulated discharge, ponding, oil removal, waste sludge disposal, ion exchange for metal recovery, and evaporation. There are 61 references.

* * *

Slaughterhouse and Packinghouse Wastes. By Donald R. Gould. Bulletin No. 14. Engineering Experiment Station, The Univ. of Tennessee, Knoxville, Tenn.

The bulletin includes useful abstracts of 190 published articles. It is published to "aid those interested in the problem of treating slaughterhouse and packinghouse wastes and stimulate others to engage in research investigations aimed at reducing the expense of treating these wastes."

Preliminary Report on Flood Protection in Kansas River Basin. Board of Engineers, Abel Wolman, Louis R. Howson, and N. T. Veatch. Dated February 2, 1953. (Kansas Industrial Development Commission, Topeka, Kansas).

In its preliminary report, the Board has presented a review of problems involved in the Kansas River Basin and of plans proposed for the control of maximum floodflows. The summary of tentative conclusions is given in four pages, and seven chapters specifically describe and discuss the studies.

As the most practicable plan of flood protection, the Board is of the opinion that channel enlargement and levees should be constructed, but only in areas where flood losses reach tremendous amounts. Construction of reservoirs, in which large amounts of money are being spent for flood capacities, should be deferred.

A clearly organized text, seven tables, and six figures, set forth the salient features of geography, meteorology, plan, cost, philosophy and policy of flood damage prevention and restraint.

Test of Water Barrier to Stop Infiltration

Manhattan Beach, Calif., has opened its underground battle with the sea by operating a $500,000 freshwater barrier test along a 5000-foot line designed to halt saline infiltration of water tables in the West Basin District.

Infiltration in the underground basin has proceeded at an alarming rate. The condition was first disclosed in geodetic surveys in 1940 followed by intervening years of experiment and study. Conditions affecting the underground water supply of communities in the district and of 22 additional such groundwater basins throughout the State may be permanently affected by the outcome of the Manhattan Beach project.

In the present test to be conducted through Nov. 5 injection wells, carrying 850 gallons of chlorinated Colorado River water per minute into the barrier, and 30 test wells will be operated on a 24-hour basis. The test wells are to determine the hour-by-hour effect of the fresh-water dike on the underground supply.

The barrier test theory was developed after successful preliminary findings were obtained in injection operations carried out in 1950 in one Manhattan district well and by fresh water spreading in an area east of Redondo Beach.

Funds for the test are from a $750,000 allocation granted by the State Legislature in 1951.

Does Safety Pay?

In reply to the question—"Do safety programs pay?" the following experience comes from W. R. LaDue, Supt. of Water and Sewage at Akron, Ohio.

In Akron the workman's compensation insurance rate on water works employees has during a twelve year safety program been reduced from $2.28 per hundred dollars of payroll to 53 cents. Supt. LaDue writes—"In 1949 our water works pay roll was $635,000. Had we been unable to reduce the $2.28 rate of past years to the 53 cent rate of 1949 we would have paid into the State Compensation Fund $14,478 rather than the $3,265 which was paid. The evident saving in that one year alone was $11,213." This pretty well answers the question—"Do water works safety programs pay?"

A "Yardstick" to Measure Odor?

A long-range investigation of taste and odor is under way at Ohio State University, the ultimate aim of the study being to learn whether a "yardstick" can be found for the measurement of taste and smell. Such measurement would be of great applied value in many fields, such as the perfume, food and tobacco industries, points out Prof. Kenneth W. Cosens, director of the project. Professor Cosens, a civil engineer, became interested in the subject of taste-odor measurement in connection with water supplies. The research is being supported by Ohio State's Engineering Experiment Station at Columbus.

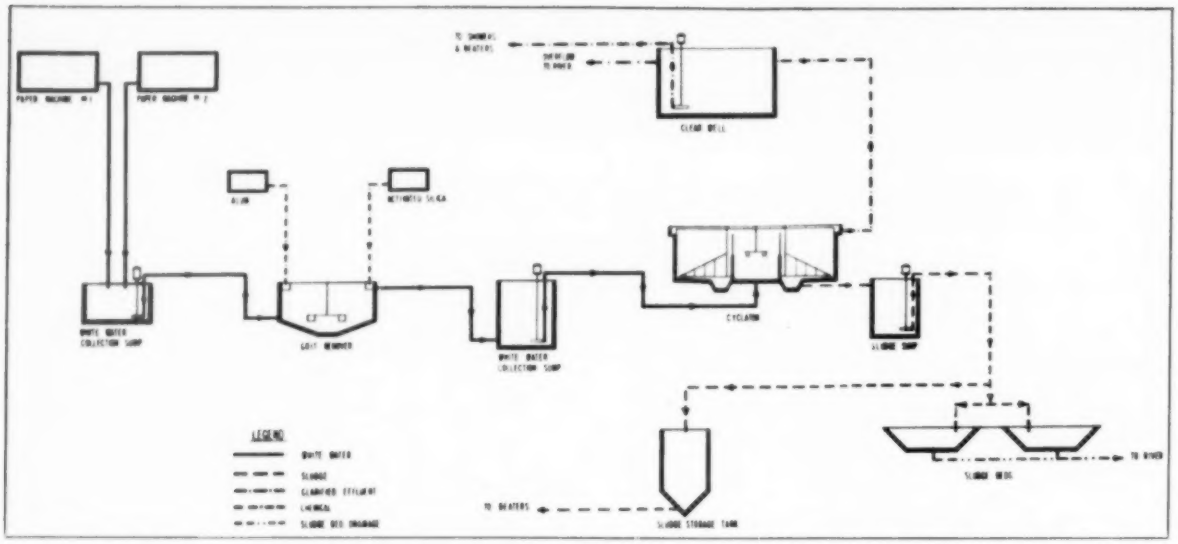

Fig. 1—FLOW DIAGRAM, waste collection and treatment system, Norristown Magnesia & Asbestos Co.

Senior Author

Asbestos Waste Treatment Solves Pollution Problem

Yearly Return from Reuse of Mill Water Approximates $70,000

by R. W. SIMPSON, J. J. SAMSEL, and E. T. DUKE*

The plant piping was altered to provide a nearly closed system. Waste water is treated by means of a grit remover and by coagulation with high rate sedimentation. Effluent is largely reused in the mill, and practically all of the sludge is returned for processing as raw material. Treatment has reduced plant water consumption and product shrinkage, and at the same time has met stream pollution requirements.

THE NORRISTOWN Magnesia and Asbestos Company, located in Norristown, Pa., is engaged in the manufacture of millboard and insulating materials. In order to comply with the Commonwealth of Pennsylvania Clean Streams Program, the management of the company embarked on a program to meet the State's regulations. Since little or no work had been previously done on wastes of this type, experimental research was required to determine the most practical and economical methods of treatment.

Pilot plant studies were made using vacuum filtration equipment, pressure filtration equipment, sedimentation equipment with and without chemical flocculation and high rate sedimentation. The results of the pilot plant studies were reported in a previous paper entitled, "Asbestos Paper Wastes Treatment," which was published in the July 1952 issue of *Water & Sewage Works*. On the basis of the data collected, the consulting engineers recommended treatment by high rate sedimentation with flocculation, using an Infilco Cyclator to provide up flow clarification for full scale operation.

Source and Strength of Wastes

The wastes treated in the system are commonly classified as "white water." The white water in excess of the requirements for make-up to the beaters, and use in the rough sprays and deckels, flows to machine pits for subsequent treatment and reuse. The waste contains portions of the raw materials used in production, which were not retained in the finished product, including short asbestos fibers, unbleached sulfite screenings, bleached sulfite, pulverized limestone, starch, mixed paper, sodium silicate, lime, cattle hair and caustic soda.

In the treatment of wastes at this mill, close-up of the system was immediately undertaken. As a result of the close-up and recirculation of waste water, there is a continual build-up of dissolved solids and B.O.D. Results of samples obtained after partial close-up, indicated the total solids of the white water to average 1367 ppm,

*Mr. Simpson and Mr. Samsel are respectively Chief Sanitary Engineer and Sanitary Engineer, Gilbert Associates, Inc., Engineers and Consultants, Reading, Pa. Mr. Duke is Plant Engineer, Norristown Magnesia and Asbestos Co., Norristown, Pa.

suspended solids 715 ppm, and B.O.D. 189 ppm. Design of waste treatment equipment was based upon these anticipated concentrations.

Flow rates are variable, but basing the flow on tonnage produced, and anticipated future expansion, a flow of 1250 gpm of waste to the treatment plant was anticipated. It was considered that the bulk of the sludge produced in treatment could be reused in the stock, thus reducing shrinkage. In order to reduce build-up of dissolved solids and organic matter, it was determined that approximately 10 per cent of the total flow would have to be wasted to the Schuylkill River.

The Treatment Units

Fig. 1 is a flow diagram of the waste collection and treatment system. The white water discharged from two cylinder-type paper machines flows by gravity to a white water collection sump. From there the white water is pumped by means of one of two (or by both) vertical centrifugal pumps to an Infilco Vortex grit remover. The grit remover separates the silica and serpentine particles carried as impurities with the raw asbestos fiber.

The white water flows from the grit remover into a collecting sump, and then is pumped by means of vertical centrifugal pumps into the Infilco Cyclator. The clarified effluent from the Cyclator flows by gravity into a clear well for storage. From the clear well, the water is pumped to the machines to be used for showers and also to beaters for make-up. The sludge from the Cyclator is pumped to a holding tank within the building to be used for make-up to the beaters. During clean-up periods, or if more sludge is available than is required, the sludge is pumped to one of two sludge holding beds for dewatering. Alum and activated silica are fed to the waste in the grit remover, proportional to the flow.

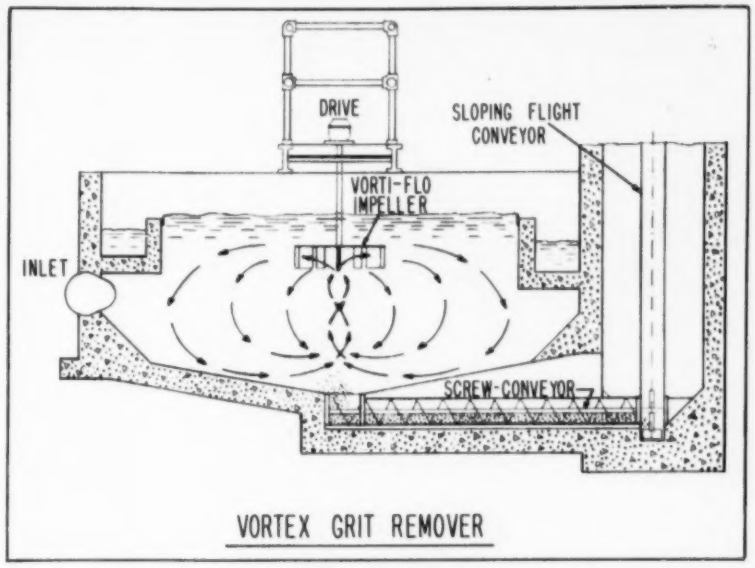

Fig. 2—INFILCO Vortex grit remover

Inlet pipe is under the overflow launder. The grit deposits in center bottom and is removed by horizontal screws and sloping flight conveyors.

Fig. 2 is a line diagram of the grit remover. The raw waste enters the grit remover through the inlet pipe beneath the overflow launder. The Vorti-flo impeller, with an adjustable speed, creates a vortex for deposition of grit in the center of the unit, from which point it is removed by means of a screw conveyor and sloping flight conveyor. The grit is deposited in barrels for removal to the dump.

Fig. 3 is a line diagram of a Cyclator. The waste from the grit remover is pumped through the inlet pipe, entering the mixing and coagulating zone, where it is mixed with recirculated sludge. The circulator, which

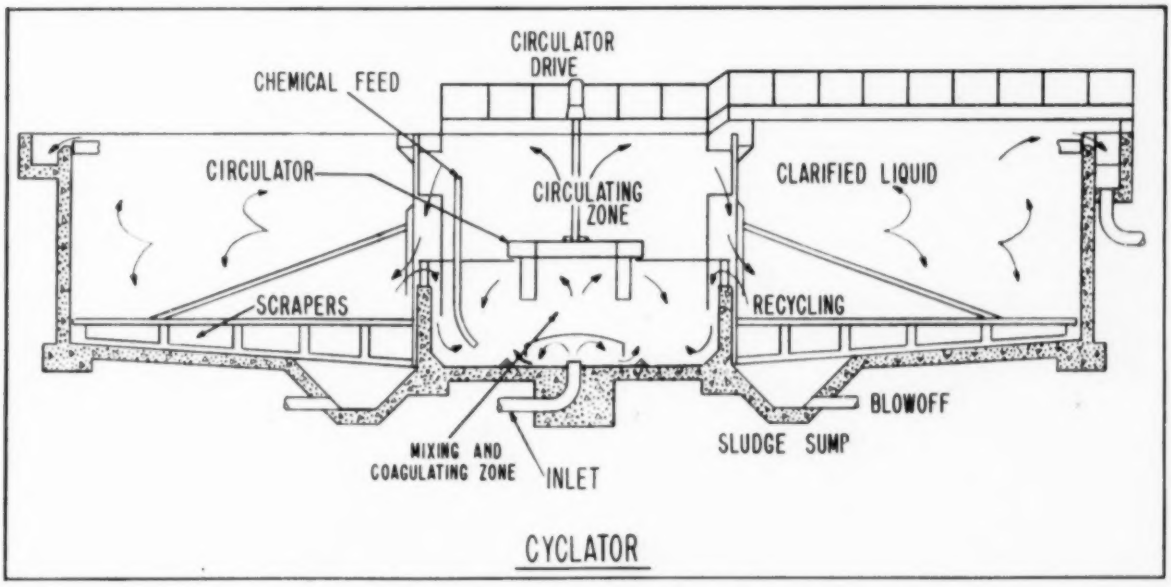

Fig. 3—INFILCO Cyclator for coagulation and clarification

Effluent from grit remover is mixed with chemicals and recirculated sludge in the center zone. It is moved to the outer zone for settling and clarified effluent discharges over a circular weir.

Fig. 4—CONSTRUCTION of the treatment plant
Concrete work for grit removal unit is in the foreground—that for the clarifier is in the background.

is in effect a pump, lifts the coagulated and mixed wastes into the circulating zone, from which point the waste flows to the settling section. In the settling section, the heavy particles separate, settling to the bottom for removal or recirculation, and the clarified waste water spills over a weir to a launder.

Design Data

The Cyclator was designed for 1250 gpm capacity with a two-hour detention period. The unit is 45 ft.-0 in. in diameter and 15 ft.-0 in. deep. The rise rate is 0.916 gal. per sq. ft. per hour. The grit collector was designed to provide a detention of approximately 3.5 minutes at maximum flow.

The two sludge beds are 40 ft. x 95 ft. x 5 ft. deep each. Drainage tile was laid on the bottom and then covered with a 1 foot layer of fine cinders. Drainage from the sludge beds flows directly to the Schuylkill River.

Construction Details

The waste treatment units were constructed adjacent to the boiler house and extend along the finished product storage building. The chemical feed equipment was placed on the second floor of the existing boiler house, providing gravity flow of alum and activated silica solutions to the point of application. A small control laboratory was set up next to the chemical feeders so that operators would have close control of the feeding equipment.

Initial construction began in September, 1950, and was completed in late May, 1951. Fig. 4 is a photograph taken during construction. The concrete work required for the grit collector can be seen in the foreground, and the Cyclator in the background. The sump and pumps required for pumping the grit collector effluent into the bottom of the Cyclator appears between the grit collector and the Cyclator. Fig. 5 is a photograph showing the completed units during actual operations, indicating the space requirements.

Start of Operation

After a few trial runs the waste treatment facilities went into full operation early in June, 1951. During the first few weeks of operation, frequent laboratory jar tests were run on the wastes in order to determine the proper amounts of alum and activated silica to be fed. This was essential, since a varied assortment of wool felt, millboard, roofing, etc., are made on both paper machines; this variation results in changes in furnish and in waste composition. As many waste combinations as possible were studied in jar tests, so that in the future the plant operators need only refer to charts to determine the feeder settings for a particular combination of wastes being treated.

Plant Operation

As is the case with all paper mills, the manufacturing plant operates on a 24-hour per day basis, and at times over the week-end, depending upon the volume of work. A full time operator is on duty at the waste treatment plant for each 8-hour shift. The operators keep an accurate running record of the treatment at all times. Samples are taken every four hours to determine the per cent by volume of suspended solids in the raw water; grit remover effluent; Cyclator draft tube at the 3-foot level, slurry pool at the 9-foot level, and the sludge pool on the bottom. The clarified effluent is checked for turbidity and alkalinity. A daily record is also kept of the rate of flow, totalizer reading, and alum and activated silica feed.

Monthly operation reports, as required by the Pennsylvania Sanitary Water Board are prepared by Gilbert Associates, Inc. The reports consist of a summary of the operators' daily reports, results of chemical analysis (hydrogen ion concentration, B.O.D. and suspended solids) and a review of the data with recommendations if any are required. One composite sample of the raw wastes entering the Cyclator and one composite sample of the treated effluent as it leaves the Cyclator is taken monthly, and analyzed to determine operation efficiency.

Operating Results

Table I is a summary of the plant operators' daily reports for each month that the waste treatment plant has been in operation. From the time the plant was put into operation until November 13, 1951, the suspended solids content of the clarified effluent was determined by comparing a sample of the effluent with standards of

Table I
Monthly Average of Results of Daily Tests
Industrial Waste Treatment Plant
Norristown Magnesia & Asbestos Company

Month	Volume Treated (Daily Average)	Alum, Added (ppm) Max.	Alum, Added (ppm) Min.	Alum, Added (ppm) Ave.	Act. Silica Added (ppm) Max.	Act. Silica Added (ppm) Min.	Act. Silica Added (ppm) Ave.	Suspended Solids or Turbidity of Effluent (ppm.) Max.	Suspended Solids or Turbidity of Effluent (ppm.) Min.	Suspended Solids or Turbidity of Effluent (ppm.) Ave.
1951										
Aug.	1,038,400	171	43	122	10	10	10	58.6	0.0	27.4
Sept.	642,500	171	68	115	10	10	10	63.5	0.0	12.7
Oct.	848,900	240	68	150	10	10	10	19.8	0.0	6.4
Nov.	839,800	240	85	170	10	10	10	*25.3	0.0	9.4
								25.0	10.0	14.3
Dec.	813,500	222	80	160	10	10	10	50.0	5.0	25.0
1952										
Jan.	626,500	188	77	139	10	10	10	50.0	9.0	17.5
Feb.	700,600	188	120	145	10	10	10	50.0	7.5	25.2
Mar.	749,500	249	85	170	10	10	10	50.0	12.5	25.1
Apr.	741,500	216	106	150	10	10	10	25.0	10.0	20.0
May	768,400	249	85	148	10	10	10	43.8	15.0	22.5
June	918,700	171	99	143	10	10	10	50.0	5.0	18.3
July	527,000	154	68	85	10	10	10	21.0	10.0	11.3

*From August, 1951 to November 13, 1951—Suspended Solids.
From November 14, 1951 to Present—Turbidity.

known suspended solids content. The suspended solids standards were made of sludge from the waste treatment plant. These standards were satisfactory for a week or two but, in due time, the solids coagulated and the standards became inaccurate. From November 14, 1951 on, the turbidity of the Cyclator effluent was determined by comparison with standard turbidity samples. Actually no great accuracy is required by the operator since these values are only indications of how the waste treatment plant is operating.

As can be seen from the results in Table I, there is a variation in the flow chiefly due to the number of machines operating and the type of product being manufactured. The amount of alum required is determined by reference to the chart prepared from jar test results. The activated silica feed is set at 10 ppm. Both alum and activated silica feeders are automatic, varying the coagulant chemical feed with the flow of waste.

A more accurate and comprehensive picture of the operation of the waste treatment plant can be had by analyzing the data tabulated in Table II. The data tabulated are the results of chemical analyses. The average B.O.D. removal through the waste treatment plant is 42.1 per cent, with a maximum of 85.1 per cent and a minimum of 10.4 per cent. The average suspendid solids removal is 86.8 per cent, with a maximum of 96.2 per cent and a minimum of 59.0 per cent.

Since only approximately 10 per cent of the total flow treated is wasted to the river, the load of suspended solids and B.O.D. discharged is within the limits allowable by the Commonwealth of Pennsylvania Sanitary Water Board.

Prior to construction of the waste treatment facilities, raw water was purchased from the City of Norristown with a quarterly expenditure of approximately $20,000. With reuse of the clarified water, the raw water costs have been reduced to approximately $2,000 per quarter, resulting in considerable savings.

Without effective waste treatment, fiber and other raw material was lost to waste. With reuse of the bulk of the sludge produced, shrinkage of raw material has been reduced approximately 9 per cent.

Installation of the waste treatment facilities has thus resulted in savings of raw water and raw material, as well as conformance with State waste treatment requirements.

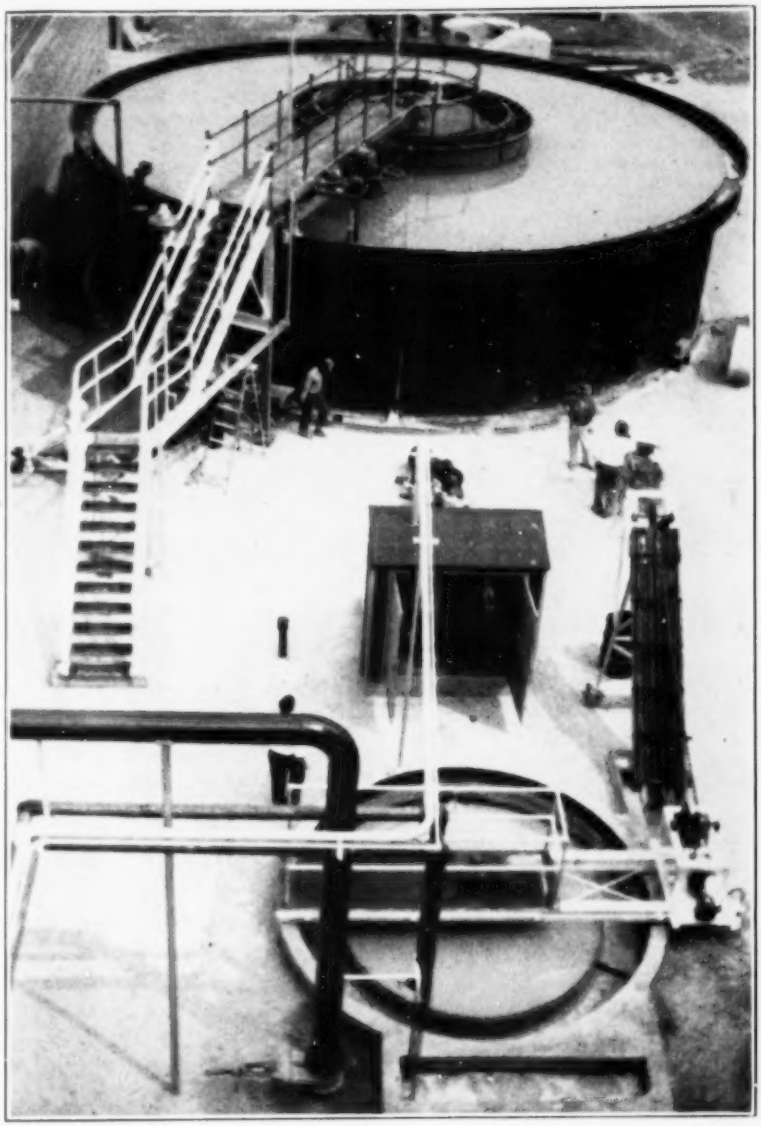

Fig. 5—COMPLETED waste treatment plant in operation
In center of photograph are pumps which discharge effluent from the grit collector to center of Cyclator.

Table II

RESULTS OF MONTHLY COMPOSITE SAMPLES
INDUSTRIAL WASTE TREATMENT PLANT
Norristown Magnesia & Asbestos Company

Date	Flow (gal/day)	Raw Waste pH	Raw Waste B.O.D. ppm	Raw Waste S.S. ppm	Treated Effluent pH	Treated Effluent B.O.D. ppm	Treated Effluent S.S. ppm	% Removal B.O.D.	% Removal S.S.
1951									
Aug. 17	211,200	.....	192	820	.....	172	76	10.4	90.7
Sept. 13	957,000	.....	416	1,840	.....	339	200	18.5	89.2
Oct. 11	1,240,300	9.0	424	956	8.6	313	72	26.2	92.4
Nov. 5	549,500	10.6	138	1,304	9.7	68	48	51.0	96.2
1952									
Jan. 3	736,400	9.8	90	1,504	9.1	28	86	69.0	94.3
Feb. 14	726,600	7.9	172	1,512	7.3	72	138	58.2	90.8
Mar. 7	977,700	9.1	224	1,558	7.1	95	352	57.6	77.4
Apr. 2	782,400	8.1	576	1,268	7.2	86	74	85.1	94.1
May 14	1,065,300	6.2	480	1,366	5.5	332	348	30.8	74.5
June 19	1,346,100	6.8	632	2,856	7.0	358	128	43.3	95.6
July 23	685,200	5.8	416	502	6.0	364	208	12.5	*59.0
Average	843,400	8.1	342	1,408	7.5	202	157	42.1	86.8
Maximum	1,346,100	10.6	632	2,856	9.7	364	352	85.1	96.2
Minimum	211,200	5.8	90	502	5.5	28	48	10.4	59.0

*Note: Low efficiency due to intermittent operation on clean-up wastes during shut-down periods.

Operating Problems

During the first few weeks of operation, two problems were encountered that periodically upset the operation of the plant. The first problem was air entrainment occurring in the sump between the grit remover and the Cyclator proper; baffling of the sump eliminated this problem.

The second problem was due to temperature variation of the incoming raw wastes. This occurred when the beater operators accidently discharged some of the paper machine stock into the white water sump. Since this stock is at an elevated temperature, the temperature of the system would increase and cause rolling of the sludge bed in the Cyclator until a temperature equilibrium was again attained.

Summary

In order to treat the white water wastes from Norristown Magnesia and Asbestos Company, the plant piping system was altered to provide nearly complete close-up. The waste water is treated by means of a grit remover and by coagulation and high rate sedimentation in a Cyclator. The bulk of the waste water is reused in the mill, and practically all of the sludge produced is returned for processing as raw material. The mill has reduced the raw water consumption and shrinkage, at the same time meeting State stream pollution requirements.

New Method of Breaking Sewers To Make Service Connections

by **H. WM. JEWELL,** *Chief, Research and Development, National Sewer Pipe Co., Toronto, Ontario, Canada*

SEWER systems frequently have been built without providing junctions for future development. Unfortunately, this makes it necessary to break through the pipe wall and cementing in a connection.

At best, this is not good practice and, in the long run, is more expensive than providing an adequate number of junctions at time of construction. Maintenance men report that many structures are seriously damaged by careless methods of breaking through pipe and that these connections are a continuous source of trouble.

In an effort to improve the practice, several maintenance men were canvassed and a number of their ideas were tried out.

The procedure discussed and illustrated here seems to merit consideration.

The idea is applicable principally to small diameter bell and spigot pipe. In this type of structure, the line is strongest at the joint and, in addition, it is easier and safer to knock off the bell section as illustrated, than to cut a hole through the pipe barrel.

Removal of the bell section allows access to the inside of the pipe at the junction of the two pipes. A small hole, large enough to insert a wrench or breaking tool as illustrated, can easily be chipped through at the end of the abutting pipes. The balance of the hole can be broken out with a wrench.

Some points of advantage to this method are:

1. The interception of the line is made at a point where there already is a joint.
2. The connection is at the strongest part of the line.
3. It is easier and safer to break through the bell section than to knock an additional hole through the barrel of the pipe.
4. After the hole is broken through the pipe, the adjacent sections of the bell and cement-filled annular space provide a supporting shoulder for the mortar sealing around the fitting (see bottom photo).

PHOTOS, top to bottom:

First—Before chipping off the bell, continue sounding until size of break is plainly marked.

Second—With chisel, chip off the bell and the cement under sounded area.

Third — Widen the area by undercutting cement and chipping down undercut area. Break through to inside of pipe where bell was removed.

Fourth—Use wrench for breaking pipe to enlarge the hole. Note supporting sections of bell.

Fifth—Fitting in position for cementing. The mortar will fill in between pipe and shoulder of fitting.

Note: * This article has also been released to the Canadian Magazine, *Civic Administration*, by the author.

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A Ranney Water Collector is far less expensive to operate—uses fewer pumps, fewer personnel, less power, and usually requires no treatment facilities.

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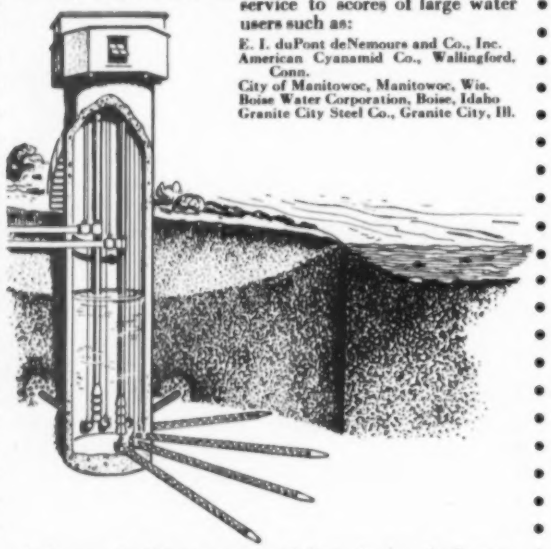

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Meetings Scheduled

June 17-19—Hershey, Pa. *(Hotel Hershey)*
PENNSYLVANIA SECTION A.W.W.A. Sec'y, L. S. Morgan, Dept. of Health, Greensburg, Pa.

June 17-19—Akron, O. *(Mayflower Hotel)*
OHIO SEWAGE & INDUSTRIAL WASTES TREATMENT CONFERENCE. Sec'y, Ward E. Conrad, 301 Ohio Dept. Bldg., Columbus, O.

June 18—York Harbor, Me. *(Marshall House)*
NEW ENGLAND WATER WORKS ASSOCIATION (June Conference). Sec'y, Jos. C. Knox, 73 Tremont St., Boston, Mass.

June 22-26—Gainesville, Fla. *(Univ. of Fla.)*
AMERICAN SOCIETY FOR ENGINEERING EDUCATION. (61st Annual Convention). Rachel Albertson, College of Engineering, Univ. of Florida, Gainesville, Fla.

June 29-July 3—Atlantic City, N.J. *(Hotels Chalfonte and Haddon Hall)*
AMERICAN SOCIETY FOR TESTING MATERIALS. Sec'y, R. E. Hess, 1916 Race St., Philadelphia, Pa.

Aug. 12—Sanford, Me.
MAINE WATER UTILITIES ASSOCIATION. Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.

Aug. 16-21—Blacksburg, Va. *(Virginia Polytechnic Inst.)*
VIRGINIA WATERWORKS, SEWAGE & INDUSTRIAL WASTES SHORT SCHOOL. Sponsored by V.P.I. and Virginia State Health Dept.

Aug. 24-26—State College, Pa. *(College Dormitories)*
PENNSYLVANIA WATER WORKS OPERATORS ASSN. Sec'y, R. R. Kountz, Penna. State College, State College, Pa.

Aug. 26-28—State College, Pa. *(College Dormitories)*
PENNSYLVANIA SEWAGE & INDUSTRIAL WASTES ASSN. Sec'y, B. S. Bush, Dept. of Health, Kirby Health Center, Wilkes-Barre, Pa.

Sept. 1-5, Winnipeg, Can. *(Royal Alexandria)*
MINNESOTA SECTION A.W.W.A. Sec'y, L. N. Thompson, Water Department, St. Paul 2, Minn.

Sept. 2-4—Ames, Ia. *(Iowa State College)*
IOWA SEWAGE WORKS ASSOCIATION. Sec'y, Leo Holtkamp, P.O. Box 310, Webster, Ia.

Sept. 2-3—Morgantown, W.Va. *(Hotel Morgan)*
WEST VIRGINIA SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, G. O. Fortney, State Dept. of Health, Charleston, W.Va.

Sept. 3-4—Morgantown, W. Va. *(Hotel Morgan)*
WEST VIRGINIA SECTION A.W.W.A. Sec'y, H. K. Gidley, State Dept. of Health, Charleston 5, W.Va.

Sept. 3-4—Escanaba, Mich. *(Hotel Not Selected)*
MICHIGAN SECTION A.W.W.A. Sece'y, T. L. Vander Velde, State Dept. of Health, Lansing, Mich.

Sept. 10-11—Lake Placid, N.Y. *(Lake Placid Club)*
NEW YORK SECTION, A.W.W.A. Act. Sec'y, Kimball Blanchard, 50 West 50 St., New York, N.Y.

Sept. 10-11—Cleveland, O. *(Hotel Cleveland)*
OHIO SECTION A.W.W.A. Sec'y, M. E. Druley, Dayton Power & Light Co., Wilmington, Ohio.

Sept. 21-23—Owensboro, Ky. *(Owensboro Hotel)*
KENTUCKY-TENNESSEE INDUSTRIAL WASTES & SEWAGE WORKS ASSOCIATION. Sec'y, R. Paul Farrell, 420 Sixth Ave. N., Nashville 3, Tenn.

Sept. 21-23—Owensboro, Ky. *(Owensboro Hotel)*
KENTUCKY-TENNESSEE SECTION A.W.W.A. Sec'y, J. W. Finney, 420 6th Ave. N., Nashville, Tenn.

Sept. 21—Santa Fe, N.M. *(Hotel La Fonda)*
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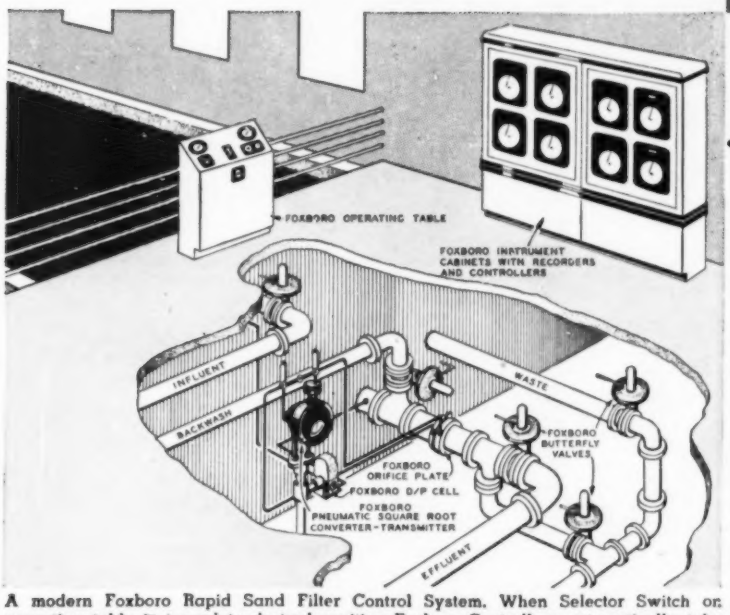

A modern Foxboro Rapid Sand Filter Control System. When Selector Switch on operating table is turned to desired position Foxboro Controllers automatically take over operational control of valves.

...a "foolproof" system that is easier to install, to operate, and to maintain

The New Foxboro Rapid Sand Filter Control System combines maximum operating convenience with a minimum of maintenance. Its all-pneumatic transmission and control eliminates drums, cables, and pulleys . . . makes possible remote operation of valves without high pressure piping to the control panel.

In normal operation, the operator needs only to turn the selector switch to one of its four positions to control: filtering; influent-off; backwashing; effluent-to-waste. Also, all adjustments of filtering and backwashing rates are easily made at the operating table.

All connections are made with ¼" copper tubing. Hence, installations with remote setting of flow rates . . . and with supplementary remote indication . . . are simple and economical.

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about **DISSOLVED AIR FLOTATION SYSTEMS**

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Bulkley-Dunton's staff of highly skilled Water Treatment Engineers specializes in developing systems and processes for the separation of

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- Solve Pollution Problems
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Some of the many industries where Bulkley-Dunton can help you:

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- Carbon separation
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- Fruit & vegetable canning
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It will definitely pay you to investigate Bulkley-Dunton's Water Treatment Engineering Services. Write for details to

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ROCKY MOUNTAIN SECTION A.W.W.A. (Sec'y, George J. Turre, Board of Water Commissioners, P.O. Box 600, Denver, Colo.

Sept. 22-24—Milwaukee, Wis. *(Hotel Pfister)*
WISCONSIN SECTION A.W.W.A. Sec'y, L. A. Smith, City Hall, Madison 3, Wis.

Sept. 23-25—Edmonton, Alberta *(Macdonald Hotel)*
WESTERN CANADA WATER & SEWAGE CONFERENCE. (Operators' School Sept. 23) Sec'y, W. J. Waddell, 617-7th Ave. East, Calgary, Alberta.

Sept. 27-29—Excelsior Springs, Mo. *(Elms Hotel)*
MISSOURI SECTION A.W.W.A. Sec'y, Warren A. Kramer, State Office Building, Jefferson City, Mo.

Sept. 28-30—Poland Spring, Me. *(Poland Spr. House)*
NEW ENGLAND WATER WORKS ASSOCIATION (72nd Annual Convention). Sec'y, Jos. C. Knox, 73 Tremont St., Boston, Mass.

Oct. 4-6—Jackson, Miss. *(Hotel Heidelberg)*
ALABAMA-MISSISSIPPI SECTION A.W.W.A. Sec'y, Chas. W. White, State Dept. Health, 537 Dexter Ave., Montgomery, Ala.

Oct. 11-13—Miami, Fla. *(Hotel McAllister)*
FLORIDA SECTION A.W.W.A. Sec'y, William W. Aultman, Dept. of Water & Power, Box 316, Coconut Grove Sta., Miami 33, Fla.

Oct. 13-16—Miami, Fla. *(Municipal Auditorium)*
FEDERATION OF SEWAGE & INDUSTRIAL WASTES ASSN. (26th Annual Meeting), Exec. Sec'y, W. H. Wisely, 325 Illinois Bldg., Champaign, Ill.
(joint meeting with)
FLORIDA SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, D. P. Schiesswohl, P.O. Box 210, Jacksonville, Fla.

Oct. 14—Rumsford, Me.
MAINE WATER UTILITIES ASSOCIATION (Annual Meeting). Sec'y, Earle A. Tarr, 15 Bowdoin St., Winthrop, Me.

Oct. 14-16—Waterloo, Iowa *(Hotel Russell Lamson)*
IOWA SECTION A.W.W.A. Sec'y, H. V. Pederson, Municipal Bldg., Marshalltown, Iowa.

Oct. 18-21—Houston, Tex. *(Rice Hotel)*
SOUTHWEST SECTION A.W.W.A. Sec'y, L. A. Jackson, Robinson Auditorium, Little Rock, Ark.

Oct. 19-24—New York, N.Y. *(Eng. Societies Bldg.)*
AMERICAN SOCIETY OF CIVIL ENGINEERS (Annual Meeting). Sec'y, Wm. N. Carey, 33 W. 29 Street, New York 18, N.Y.

Oct. 20-23—Atlantic City, N.J. *(Chalfonte Hotel)*
PENNSYLVANIA WATER WORKS ASSOCIATION. Sec'y, W. A. Kufs, 510 Telegraph Bldg., Harrisburg, Pa.

Oct. 22-24—Atlantic City, N.J. *(Madison Hotel)*
NEW JERSEY SECTION A.W.W.A. Sec'y, C. B. Tygert, Box 178, Newark 1, N.J.

Oct. 26-29—New Orleans, La. *(Roosevelt Hotel)*
AMERICAN PUBLIC WORKS ASSOCIATION. Exec. Sec'y, Donald F. Herrick, 1313 East 60th St., Chicago, Ill.

Oct. 27-30—San Francisco, Calif. *(Palace Hotel)*
CALIFORNIA SECTION A.W.W.A. Sec'y, J. C. Luthin, 1113 Laurent St., Santa Cruz, Calif.

(Continued on page 94A)

R-S valvEvents

• EXCERPTS FROM THE R-S BOOK OF EXPERIENCE •

R-S Valves provide quick opening yet tight means of overflow control. Photograph courtesy William Allen Son's Company, Worcester, Mass.

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- with metal to metal seat including babbit or rubber seat
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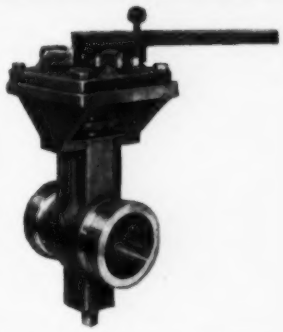
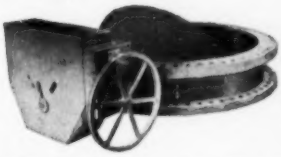
- in all sizes for all industries and processes, and in the temperature range from minus 300° to plus 2000° F. 2 to 2500 psig.

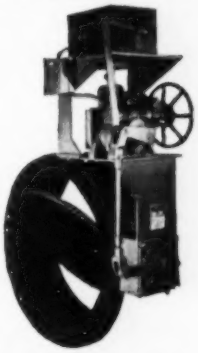
Representatives are listed in telephone directories as: "R-S Products Corporation Valves".



No. 674—Special 2½-inch stainless steel valve with 150 psi construction. Standard sanitary type threads. Heavy duty handlever assembly Type No. 681.



No. 848—Heavy duty valve with rubber seat for water service at high velocity. Handwheel operates valve through spur gear and pinion into a threaded reach rod (enclosed Type No. 700) in order to obtain sufficient torque to seat disc in rubber.



No. 847—Heavy duty valve with electric motor operator mounted directly above valve and positioned by pressure controller mounted above the motor.

Consult your local R-S Valve Engineers, or write direct.

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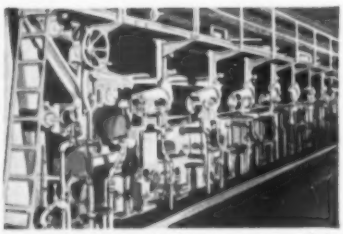
CELITE FILTRATION removes harmful impurities and purifies water for re-use



In paper plants "White" water used in paper formation is purified for re-use by Celite Filtration. The Celite method can also provide clean pure process water in many other industrial uses—for boiler make-up, heat exchangers, circulating water for towers, etc.

In oil wells—output is boosted by re-pressurizing wells with water to force out accumulated oil. Celite Filtration purifies water to the extreme degree required—removes the minute suspended impurities which would otherwise clog the microscopic pores of sandstone.

CELITE* FILTRATION can reduce your process water costs materially—and it can greatly aid your community's water conservation and anti-pollution programs.

If your plant now discharges industrial water as waste, Celite Filtration enables you to purify this water for *re-use*—at relatively low cost. Celite removes all types of suspended solids. When required, it even filters out fine matter such as amoebae and algae, many of which cannot be removed by other methods. Thus by recycling process water you can save on water costs . . . and save your community's water.

At such times as you still find it necessary to discharge process water, Celite Filtration is an important anti-polution measure. It helps make water safe and harmless . . . thereby protecting your community's recreational areas, fish and wildlife.

Food processors, beverage manufacturers, swimming pool operators and many industrial users of process water depend on Celite Filtration.

It will pay you to investigate the unique advantages of Celite for your particular application. Celite itself is carefully processed from the purest deposits of diatomaceous earth. It comes in nine standard grades, and you are always assured of utmost uniformity of product. To have a Celite engineer study your problem and offer recommendations, simply write Johns-Manville, Box 60, New York 16, New York. In Canada, 199 Bay Street, Toronto 1, Ontario. *T.M. Reg. U.S. Pat. Off.

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Johns-Manville CELITE FILTER AIDS

Pickups from "Sanitary Engineering News"

Don E. Bloodgood, Editor

In Poland more than 20 municipalities and many separate industrial establishments (starch plants, yeast plants, etc.) treat sewage on irrigation fields. The smallest dosage considered satisfactory is 21,400 gallons per acre.

* * *

Comparative water production costs for Detroit-Michigan:

	1922-23	1949-50
Wages	37	23
Replacements & Imp.	16	38
Debt Charges	33	24
Opr. & Maint.	14	15
	$1.00	$1.00

* * *

When you have become bored with the world and there seems nothing of interest near at hand, pick up a can of earth from your back yard. Sort out ten grains of material and then start a study on where they each came from. Well you might do the same thing for a drop of water.

* * *

The sewage treatment plant for the Minneapolis-St. Paul Sanitary District uses 30 cars of lime, 12 cars of ferric sulphate, and 20 cars of fuel oil per year for sludge dewatering and incineration.

* * *

Ion-exchange units can be disinfected during regeneration with chlorinated melamine.

New York City Sewage Program Delayed by Lack of Engineers

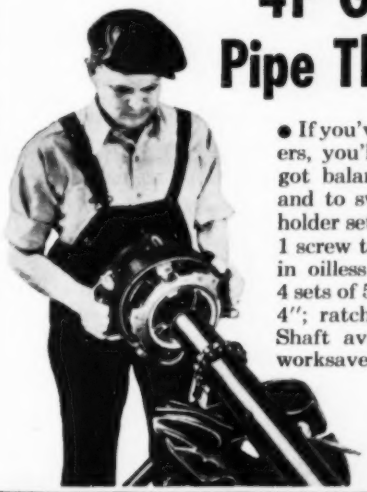
A shortage of mechanical and electrical engineers will make it impossible for New York to complete the $100,000,000 first phase of its pollution-control program by the end of this year, according to Frederick H. Zurmuhlen, Commissioner of Public Works.

By failing to complete and put into operation enough sewage dis-

RIDGID means most service for your money!

Never before one so easy to carry—
easy to put on pipe...

RIDGID
4P Geared
Pipe Threader



• If you've rassled with old-style geared threaders, you'll go strong on this RIDGID 4P. It's got balanced loop handles—a cinch to carry and to swing onto pipe. Mistake-proof workholder sets to size before it's put on pipe—only 1 screw to tighten. Easy upkeep—drive pinion in oilless bronze bearing; safe enclosed gear. 4 sets of 5 high-speed steel dies, 2½", 3", 3½", 4"; ratchet handle. RIDGID Universal Drive Shaft available — also 4P for conduit. Buy worksaver 4P at your Supply House.

THE RIDGE TOOL COMPANY
ELYRIA, OHIO

RIDGID
Work-Saver Pipe Tools

posal plants to purify all of its "Class A" or principal recreational waters by the end of 1953, the city will be technically in violation of a consent decree issued by the Interstate Sanitation Commission in 1948.

Despite the slowdown in construction of sewage disposal plants caused by the lack of engineers, the city has completed and put into operation enough of these facilities to clean up the waters of all the city beaches where New Yorkers will bathe this summer, the Commissioner declared.

The city is two projects short of meeting the end-of-1953 deadline for the first phase of the gigantic pollution-control program. They are expansion of the Bowery Bay Treatment Works in Astoria, Queens, and construction of a $7,000,000 Oakwood Beach treatment plant on Staten Island.

New A.W.W.A. Standard for Lime Specifications

Specifications for quicklime and hydrated lime have been published by the American Water Works Association, 521 Fifth Ave., New York 17, N.Y., and may be obtained upon advance remittance of 25c. The standard covers pepple, lump, or ground quicklime and hydrated lime for use in the treatment and softening of municipal and industrial water supplies.

Because of the wide variation in available calcium oxide content of the commercial product, purchase on a bonus and penalty basis has been recommended. Methods of analysis also vary so widely that five different procedures are offered, and manufacturer and purchaser should agree in advance upon the method to be adopted.

Wide World Photo

this could happen in your town

THIS CITY STREET CAVED IN when a water main broke. It's a dramatic, but not an unusual example of what water does to road bedding.

Protect your roads and pipes from the problems of leakage by Centrilining. This patented process thoroughly cleans and centrifugally lines pipes with cement mortar. Leakage, tuberculation and interior corrosion are permanently checked . . . carrying capacity and distribution pressure are increased to "better than new" highs. And the whole process is done with pipes in place . . . no excavation . . . no traffic disruption.

With Centrilining you can save your water mains . . . and streets too.

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CEMENT-MORTAR LININGS FOR PIPES IN PLACE

3,000,000 FEET OF EXPERIENCE

CENTRILINE CORPORATION

A subsidiary of Raymond Concrete Pile Co.

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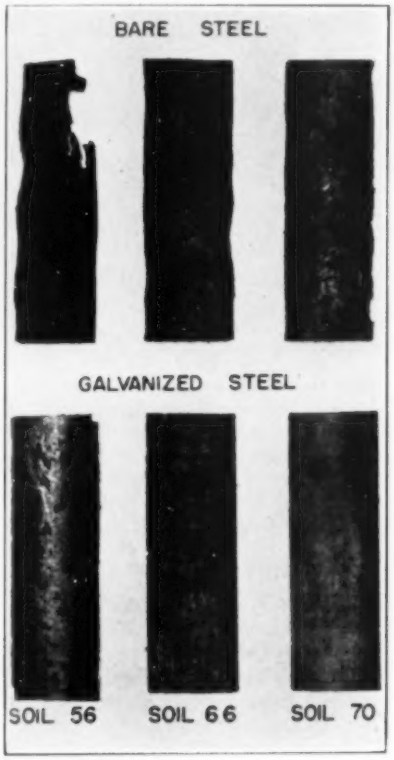


UNDERGROUND Corrosion of Steel Pipe

Specimens of bare steel pipe (above) and galvanized steel pipe (below) after 13 years exposure to various soils.

Bureau of Standards Studies Underground Corrosion of Galvanized Steel

A study of underground corrosion of hot-dipped galvanized steel pipe has recently been completed by the National Bureau of Standards. Results confirm previous NBS work in showing that galvanized steel having 3 ounces of zinc per square foot of exposed surface is highly resistant to corrosion in many soils which are very corrosive to bare steel.

For the Bureau's study, short lengths of both galvanized and uncoated steel pipe, and also plates of zinc, were buried at 15 test sites for periods up to 13 years. Located in widely separated parts of the United States, the test sites represented a wide range of soil properties. After each of five periods of exposure, a set of specimens of each material was removed and returned to the NBS laboratories. After removal of the corrosion products, determinations were made of loss in weight, depth of the deepest pits, and the percentage of area of the galvanized specimens on which coating remained. Although the nominal weight of the zinc on all the coated specimens was 3 ounces per square foot, the actual thinckness varied over a wide range.

The zinc coatings provided good protection in most of the soils. In one soil in which bare steel pipe was perforated by corrosion after exposure for only a few years, the coating on the galvanized specimens remained perfectly continuous throughout the entire 13-year period. In only two of the 15 soils, both organic, was the zinc coating of negligible protective value.

An interesting finding of the NBS study was the high corrosion resistance that the galvanized specimens continued to show in most of the soils after the outer zinc coating, and even after the zinc-iron alloy layer, had entirely corroded away. This continuing protection is tentatively attributed to an inorganic coating, probably silicious, believed to have been deposited by galvanic action between the outer zinc coating and the underlying steel or alloy layer.

Analysis of the data obtained in the course of the two NBS field studies shows that the minimum weight of zinc coating required to protect steel for a minimum of 10 years depends on the nature of the soil environment. In the NBS studies a 2-ounce coating gave sufficient protection in inorganic oxidizing soils, but for inorganic moderately reducing soils a 3-ounce coating was required. Highly reducing soils, both organic and inorganic, require coatings heavier than 3 ounces per square foot.

In order to obtain maximum life from galvanized pipe in practice, it is necessary either to construct the entire piping system of galvanized pipe or else to electrically insulate the galvanized sections from pipe of other metals. Otherwise, the zinc coating will be removed by galvanic action.

THE Ferri-Floc WAY
IS A
BETTER WAY!

You Can Expect
These Advantages
With Ferri-Floc-

1. Rapid Floc Formation
2. Taste and odor control
3. Color removal
4. Ease of operation
5. Bacterial removal
6. Manganese and Silical removal
7. Turbidity removal
8. Economy

Ferri-Floc has the ability to coagulate waters over wide PH Ranges and will provide excellent flocculation in softening systems.

SULPHUR-DIOXIDE is effectively used for dechlorination in water treatment and to remove objectionable odors remaining after purification.

SULPHUR-DIOXIDE SO_2

COPPER SULPHATE will control about 90% of the micro-organisms normally encountered in water treatment plants more economically than any other chemical.

COPPER TC SULPHATE

Free Literature! —Send card or letter to Tennessee Corp., Grant Building, Atlanta, Georgia.

TENNESSEE CORPORATION

617-29 Grant Building, Atlanta, Georgia

TC TENNESSEE CORPORATION

...Meet all State and Municipal Sewage Waste Disposal and Stream Pollution Regulations

Now there is a real solution to the problem of screening solids out of manufacturing waste water *before* it reaches the main sewage disposal outlets. SWECO Separators will screen from 90% to 100% of all solids from waste liquids on a production basis through screens from 50 up to 325 mesh. SWECO Separators are doing a job in the following and many other industries:

PULP & PAPER	LUMBER
TEXTILES	CHEMICALS
CANNING	REFINERY
CERAMICS	MINING

Send for catalog and name of your nearest SWECO *Sales Engineer.*

SWECO

SEPARATOR DIVISION
SOUTHWESTERN ENGINEERING COMPANY
4800 Santa Fe Avenue, Los Angeles 58, Calif. 5-9

Meetings Scheduled

(*Continued from page 88A*)

Oct. 28-30—Wilmington, Del. *(Hotel DuPont)*
CHESAPEAKE SECTION A.W.W.A. Sec'y, C. J. Lauter, 6955 33rd Street, Washington 15, D.C.

Nov. 4-6—Roanoke, Va. *(Hotel Roanoke)*
VIRGINIA SECTION A.W.W.A. Sec'y, W. H. Shewbridge, 708 State Office Bldg., Richmond 19, Va.

Nov. 9-11—High Point, N.C. *(Sheraton Hotel)*
NORTH CAROLINA SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, E. C. Hubbard, State Board of Health, Raleigh, N.C.

Nov. 9-11—High Point, N.C. *(Sheraton Hotel)*
NORTH CAROLINA SECTION A.W.W.A. Sec'y, E. C. Hubbard, State Board of Health, Raleigh, N.C.

Nov. 12-13—Lincoln, Neb. *(Hotel Capitol)*
NEBRASKA SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, Paul W. Mousel, 602 W. B. Street, McCook, Neb.

Nov. 18-23—New York, N.Y. *(Statler & New Yorker)*
AMERICAN PUBLIC HEALTH ASSOCIATION. Sec'y, Mrs. W. R. Walsh, A.P.H.A., 1790 Broadway, New York, N.Y.

Nov. 16-20—Stillwater, Okla. *(Okla. A. & M. College)*
OKLAHOMA WATER, SEWAGE & IND. WASTES SHORT COURSE. Sec'y, H. J. Darcey, State Dept. of Health, Oklahoma City, Okla.

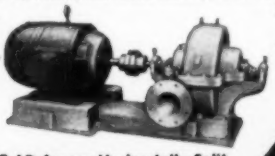
Dec. 9—Waterville, Me.
MAINE WATER UTILITIES ASSOCIATION. Sec'y, Earl A. Tarr, 15 Bowdoin St., Winthrop, Me.

Dec. 13-16—St. Louis, Mo.
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS. (Annual Meeting). Sec'y, F. G. Van Antwerpen, 120 East 41st St., New York 17, N.Y.

Faithful Performance on Important Jobs

— such as water supply, brine circulation, booster service, white water and overflow, hot well, makeup water, etc., etc.

Capacities to 1,200 G.P.M.
Heads to 460 Ft.



PUMPS *"by Aurora"*

For Every Purpose

TYPE-AD Aurora Horizontally Split Case, Back-to-Back Impellers, Two Stage Centrifugal Pump. Particularly suited to clear water and low viscosity liquids not containing solids. *Write for* BULLETIN 106

APCO TURBINE-TYPE PUMPS are unbeatable on low capacity, high head duties.

Capacities to 150 G.P.M. Heads to 500 Ft.

AURORA CENTRIFUGAL PUMPS are available in many types and sizes —all noted for their streamline coordination between impellers and shells.

Write for CONDENSED CATALOG "M"

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA Always PUMPS

AURORA PUMP COMPANY

SUBSIDIARY OF THE NEW YORK AIR BRAKE COMPANY
68 Loucks St., Aurora, Illinois

Beach Clow Dies From Heart Attack

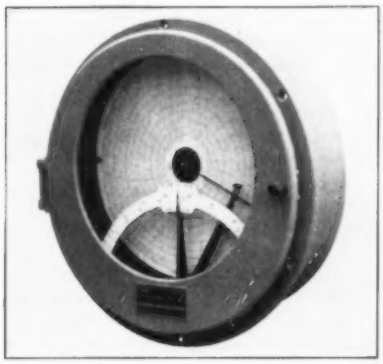
J. Beach Clow, Chicago industrialist and civic leader, died May 5 at his home in Lake Forest, Ill., after a heart attack. He was 49 years old.

Beach Clow, well known and popular in the water and sewage works field, was vice-president of James B. Clow & Sons, long established manufacturers of water and sewage works equipment and plumbing supplies. In addition he was president of two subsidiary Clow companies, the Eddy Valve Co. of Waterford, N.Y., and the Iowa Valve Co. of Oskaloosa, Iowa.

A native of Chicago, Mr. Clow was a 1926 graduate of Yale University. He served in the U.S. Navy during World War II as a Lieutenant Commander, seeing service in the South Pacific and in Germany.

Amongst his civic activities, Mr. Clow was one-time president of the Welfare Council of Chicago and first vice-president of St. Luke's Hospital board of trustees.

Surviving Mr. Clow are his widow, his daughter, one son, and his mother.



Recorder Provides Permanent Data on Sewage Flow

601

Leupold & Stevens Instruments, Inc., Portland, Ore., has developed

WATER COMMISSIONERS
OF THE
TOWN OF WATERFORD, N.Y.

September 15, 1952

Simplex Valve and Meter Co.,
68th & Upland Sts.
Philadelphia 42, Pa.

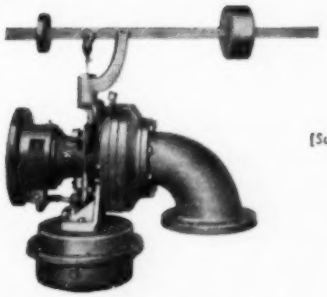
Dear Sirs:

Please send us two (2) rubber diaphragms for Simplex rate controller #6-111325 B.

Might be of interest to know that this is second replacement of diaphragm since 1914.

Respectfully yours,
R. G. Jaffray
Water Commissioners,
Waterford, N. Y.
Supt.

Another proof that Simplex is reliable in the long run!



Simplex Type S
Rate of Flow
Controller
[Supersedes Type B Controller Referred to in Letter]

For full details, write:
Simplex Valve & Meter Company,
6743 Upland St., Philadelphia 42, Pa.

SIMPLEX®
VALVE AND METER COMPANY

a Stevens Type B-FT recorder that provides permanent data on sewage flow.

The recorder, which may be wall, pedestal or panel mounted, uses a circular chart which makes one revolution per day or per seven days, as specified, while the pen swings in an arc around an external center. The combined movements produce a graph of the rate of flow against time. Volume is indicated on a counter-type totalizer.

Accuracy of the registration is limited only by the accuracy of the rating to which the totalizer is set. Flow or head (or both) may be indicated on a scale clearly visible through a large glass port.

Wilkes to Head Dearborn Research

Dearborn Chemical Company, Chicago, Ill., has announced the appointment of Mr. J. F. Wilkes to Director of Research and Product Development, in which capacity he will maintain responsibility for the operation and administration of the company's laboratory.

Mr. Wilkes received his BSChE degree from the University of Florida, graduating in 1933 with honors including Sigma Tau and Florida Blue Key. Also he was awarded the Professional Degree, Chemical Engineer by the University of Florida in 1951.

After spending six years with the Chesapeake and Ohio Railway, Water Supply Department, Huntington, West Virginia, where he held successive positions as Laboratory Assistant, Assistant Chemist, and Chemist, Mr. Wilkes joined Dearborn Chemical Company in 1939 as Chemical Engineer.

In January, 1946, after 4 years of military service Mr. Wilkes rejoined Dearborn as Technical Director, Railroad Department, Chicago. He successfully maintained this position until his recent appointment.

SMITH VALVES

WITH "O" RING SEAL

"O" Rings replace conventional packing and reduce maintenance to a minimum. The lower "O" Ring is the pressure seal, the upper "O" Ring the dirt seal. The specially compounded rubber plastic "O" Rings do not deteriorate and insure a long life pressure seal.

All Smith Valves can be equipped with "O" Ring Seal Plates. Write for details.

THE A.P. SMITH MFG. CO.

EAST ORANGE, NEW JERSEY

New Loss-In-Weight Feeder For the Smaller Plants

602

Omega Machine Co., Providence, R.I., has developed a new Model GLW-O Feeder that extends the advantages and safeguards of Omega gravimetric feeders to smaller plants. The new "O" Feeder is ideal where accurate, low rates of feed, limited floor space and low cost equipment are essential factors. Attractive and compact in design, it requires only 26 x 33 inches floor area and 25 inches front and back for door clearance.

The feeder is accurate to 99 per cent or better, delivering either powdered, granular or lump material up to ¾ inch size. Its wide feed range permits 0-to-100 per cent settings for any capacity within a minimum of 0.25 pound per hour and a maximum of 100 pounds per hour. A totalizer registers in pounds the total amount of chemical fed.

Operation of the feeder is simple. The rate is set by a single dial. No

calibration is ever required; no timing or catching of samples is necessary to determine rate of feed. Its operation is dustless. As much as five cubic feet of chemical can be stored in the hopper.

B. M. Byers Appointed Gen. Mgr. of Wrought Iron Sales

A. M. Byers Company, Pittsburgh, Pa., has announced the appointment of Buckley M. Byers, grandson of the firm's founder, as General Manager of Wrought Iron Sales.

Mr. Byers joined the firm in 1940 after his graduation from Yale University. He served as Assistant Manager of the Company's Washington Office before entering the U.S. Navy as an Ensign in 1942.

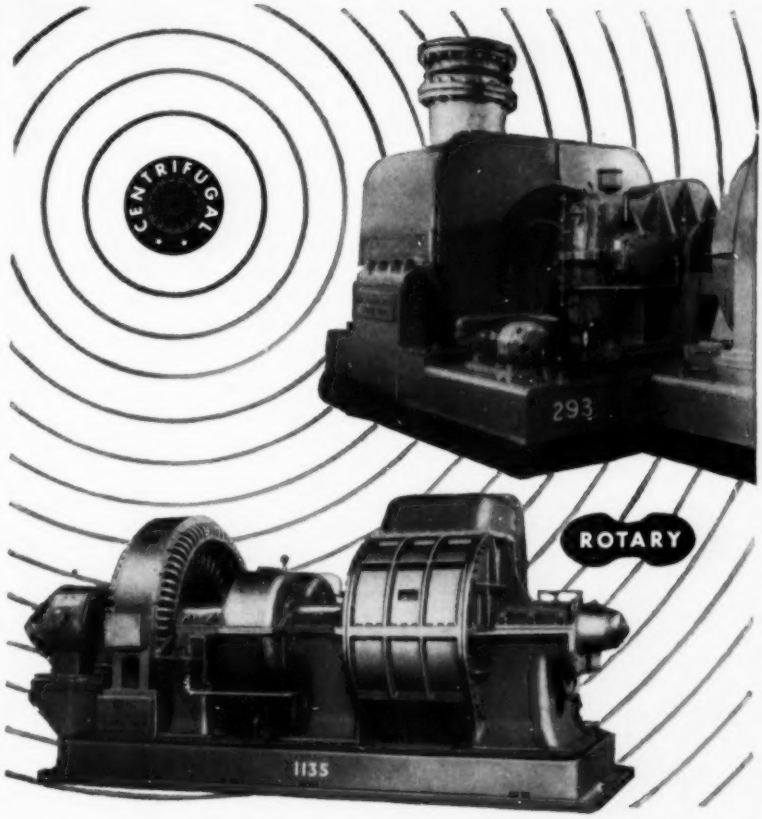
Upon his return to A. M. Byers Company, he was made Assistant Manager of the firm's New York Office.

In April, 1947, he became Manager of the Export Department, and on February 1, 1951 he was appointed Assistant Manager of Steel Sales. He has been a Director of the Company since 1948.

C. A. Brown Joins Rensselaer

Rensselaer Valve Company, Troy, N.Y., has announced that Mr. Cecil A. Brown of Pine Bluff, Arkansas, has joined its sales force. He will represent the company in the States of Arkansas, Missouri and Louisiana, with headquarters in Arkadelphia, Arkansas.

Mr. Brown is well qualified for his new position having been, prior to coming with Rensselaer, Manager of the Pine Bluff water system. He has been active in the water works field



ONLY THE BLOWER *Specialists*

BUILD THE DUAL-ABILITY LINE

To meet the varying problems of handling air or gas in sewage treatment plants, Roots-Connersville builds two complete lines of blowers—Rotary Positive and Centrifugal. Together, they cover capacity requirements from 5 cfm to 100,000 cfm in single units. Thus, from this exclusive *dual-ability line*, units can be selected (without prejudice as to type) to match the needs of small community plants, industrial wastes treatment, or large volumes in metropolitan areas.

Regardless of the type or size which you may need, R-C Blowers are unmatched in reliability and long-time performance. Built into them is almost a century of specialized experience in handling gas and air, which is our exclusive business.

The long and increasing list of sewage treatment plants which are R-C equipped is perhaps the best evidence of continued satisfaction. These include many "repeat" buyers. If you have projects under way, and would like to talk to nearby users, we shall be glad to furnish their names. And, whenever we can assist in planning your installations of blowers and related equipment, our specialists are at your service.

ROOTS-CONNERSVILLE
Exclusive Specialists in Handling Gas and Air

ROOTS-CONNERSVILLE BLOWER
A DIVISION OF DRESSER INDUSTRIES, INC.
536 Mount Ave. • Connersville, Indiana

● If interested in equipment or literature mentioned below, mail a Reader Service Card with your name, address, and item key number.

for some years, and is a member of the Arkansas Water and Sewage Association and of the Southwest Section of the American Water Works Association.

Electronic Utilities Control

603

International Business Machines Corp., New York, N.Y. has developed new applications of IBM Electronic Time and Program Controls using AC lighting wires. These controls, used with the proper intermediate electrical devices, provide a unique automatic means of programming the starting and stopping of many mechanical functions without the need for special wiring.

Applications for which IBM Time and Program Controls can be used include the operation of relays, solenoids, and motors to open and close ventilators, turn heating and air conditioning systems on and off, actuate flush valves, switch light circuits on and off, sound signals, and open and close lawn sprinklers and irrigation equipment.

The programs can be set up on a varied daily schedule as well as for inoperative periods such as week-ends, resulting in savings not only in maintenance and operating expenses, but also in resources such as water, oil, coal, electricity and gas.

Builders Iron Foundry Expands Works Area

Builders Iron Foundry, Providence, R.I., has announced the acquisition of an extra 87,000 square feet of manufacturing space. The property, a parcel of the former Textile Finishing Co., adjoins the Harris-Kinsley Avenue work area of the company.

The new building increases the total shop and office space to 258,000 square feet. Present plans call for use of 15,000 square feet in the new building by an affiliate, the Omega Machine Co.

Test Kit For Swimming Pools

604

Hellige, Inc., Garden City, N.Y., has developed the Hellige Twin-Kit for the control and maintenance of swimming pool waters.

The kit consists of twin pocket-sized comparators with six glass color standards mounted securely in each housing. One comparator is used for pH, the other for chlorine or bromine determinations.

Direct readings are obtained in the simple 3-step procedure and technical knowledge is not needed. Hellige Non-Fading Glass Color Standards are guaranteed to be permanently reliable and color comparisons can be performed with utmost precision.

MH
TRAFFIC MODEL
FIRE HYDRANTS
M & H Traffic Model Fire Hydrant is designed with a breakable coupling and breakable bolts at the ground line. In the event of traffic accident, the breakable parts separate without damage to other parts of the hydrant. Repair costs are negligible, quickly and easily done with another breakable coupling and eight breakable bolts. This repair work can be done without shutting off the water. M & H Traffic model is similar in design to M & H standard A. W. W. A. hydrant, and parts are interchangeable. For complete information, write or wire M & H Valve and Fittings Company, Anniston, Alabama.
OTHER MODELS
(1) A. W. W. A. standard (2) Mill Yard or "I. G. N." (3) Approved and listed by Underwriters' Laboratories and Associated Factory Mutual Laboratories. (4) Flush type fire hydrants which set completely underground.
M&H PRODUCTS
FOR WATER WORKS • FILTER PLANTS INDUSTRY • SEWAGE DISPOSAL AND FIRE PROTECTION

Chicago Bridge Elects Sangdahl V.P.

Chicago Bridge & Iron Company, Chicago, Illinois, has announced that Mr. George S. Sangdahl was elected a Vice President on April 13, 1953. He has been associated with the Company since Jan. 15th, 1915.

Mr. Sangdahl was graduated with B.S. degree in Engineering from the University of Illinois in 1913. He started working in the Sales department of the Chicago Bridge & Iron Company doing design and estimating work, was Manager of the Montreal, Que., Sales office of the Company's Canadian affiliate, Horton Steel Works Limited, for five years, and has been Manager of the Company's Cleveland Sales office since 1925.

On May 4th Mr. Sangdahl became Manager of a new sales office which the Chicago Bridge & Iron Company opened in Pittsburgh, Pa. It is located in the Alcoa Building.

J. Leslie Hart

P. K. Farrington

U.S. Pipe Advances Hart and Farrington

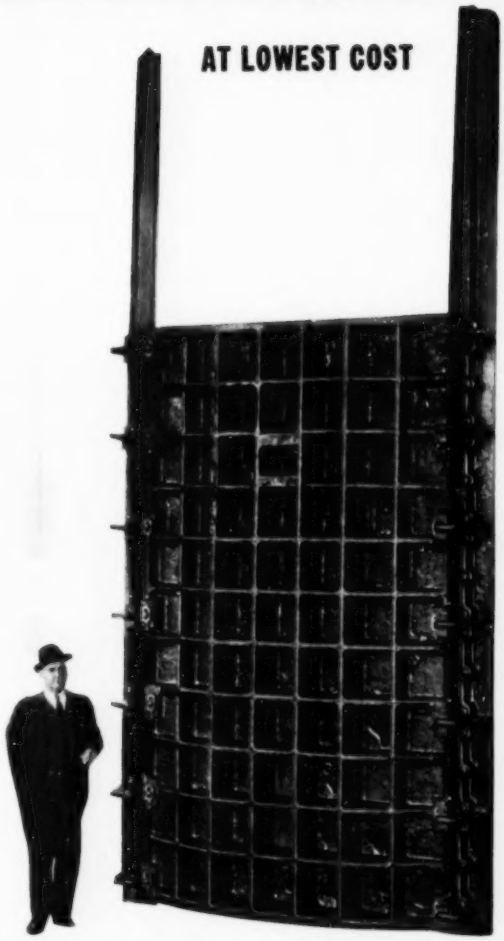
U.S. Pipe & Foundry Co., Burlington, N.J., has announced that J. Leslie Hart now Western Sales Manager in Chicago has been appointed Eastern Sales Manager and will be located at Burlington, N.J. Mr. Hart has been secretary of the Illinois Section, American Water Works Association, for the past three years.

P. King Farrington now Assistant Pacific Coast Sales Manager in San Francisco has been appointed Western Sales Manager replacing Mr. Hart.

These appointments are to be effective July 1, 1953.

DEPENDABLE PERFORMANCE

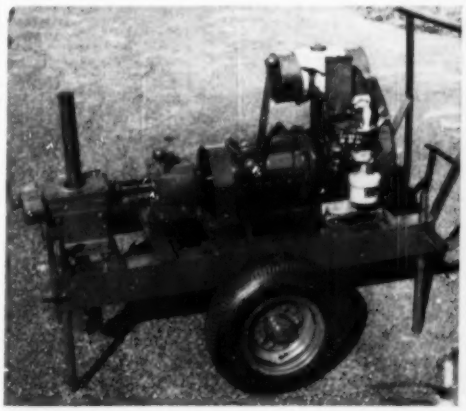
AT LOWEST COST



FILER & STOWELL SLUICE GATES

are built to stand long trouble free service. Amply proportioned for all stresses of shipment, erection and operation. They may be obtained with manual, hydraulic cylinder or motor operating controls.

THE FILER & STOWELL COMPANY
MILWAUKEE 7, WISC.



GATE OPERATORS — PORTABLE — FOR STANDS & UNDERGROUND GATES—MOTOR TRUCK MOUNTED

PAYNE DEAN & CO.
CLINTON, CONN.

A-C Organizes Rocky Mountain Region

Allis - Chalmers Manufacturing Company, Milwaukee, Wisconsin has announced the combination of Allis-Chalmers district and branch office territories of Denver, Salt Lake City, Phoenix, El Paso, and Spokane into the Rocky Mountain Region with headquarters at Denver.

Richard D. Moody, since 1950 manager of the Los Angeles district office, has been appointed manager of the new region.

A graduate of the Colorado School of Mines, Moody joined Allis-Chalmers graduate training course in 1938. He was connected with the company's Knoxville and Chatanooga offices before entering military service in 1941. He was discharged from the U.S. Army Engineers in 1946 as a lieutenant colonel and assigned to Allis-Chalmers San Francisco office where he was named manager in July, 1947.

Chemical Resistant Coveralls

605

Filtration Fabric Div. of Filtration Engineers, Inc., Newark, N.J., has developed the Feon Chemical Resistant Coveralls. The coveralls are made of a new light-weight, tough, acid and alkali-resistant Vinyon-N fabric, and are designed to fit the working man while he's working, not just standing still.

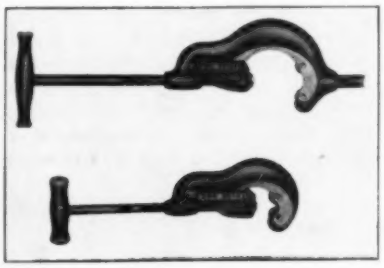
The coveralls offer complete resistance to chemicals and commercial launderings and feature pleated back, deep armpits and crotch, and deep pockets. The Feon fabric is tough and strong, yet is cool, smooth, and is never stiff or scratchy. Admiralty grey in color, it will not show dirt readily.

TANK
with a FUTURE
This tank in some respects looks like hundreds of others, but unlike many, it has a brighter future of longer life and greater service, because it is protected by an Electro Rust-Proofing system.
Efficient control of corrosion on submerged surfaces requires much engineering, some equipment. Careful analysis of your problem . . . design, installation and testing by men who are experienced in their work . . . the "know-how" of an established firm . . . "follow through" of every job—on these and similar engineering details rest effective cathodic protection.
Highly trained, backed by a long list of successful installations and years of experience, our engineer is always ready to help you solve your corrosion problem. For complete information, write today.
ERP-21
ELECTRO RUST-PROOFING CORP. (N. J.)
BELLEVILLE, NEW JERSEY
Over 15 years of cathodic protection engineering, research and development
COMPLETE CATHODIC PROTECTION SERVICE
DESIGN
ENGINEERING
INSTALLATION
MAINTENANCE
EQUIPMENT

Trotter Assigned To B-I-F Buffalo Office

Builders Iron Foundry, Providence, R.I., has announced the appointment of Herman E. Trotter as Buffalo, N.Y., representative of B-I-F Industries. Mr. Trotter will handle sales of Builders-Providence, Inc., flow meters and controllers and Omega Machine Co. chemical feeders in this area. The office is at 3053 Main Street.

A graduate of Yale University, he is a member of Cum Laude Society, Delta Phi Fraternity and Providence Engineering Society. Previous experience included work as Utilities Security Analyst with a Massachusetts insurance firm, and sales engineer training in the Providence office of B-I-F Industries.



Wheel Pipe Cutters

606

Beaver Pipe Tools, Inc., Warren, Ohio, is now maufacturing a newly

engineered, redesigned line of wheel pipe cutters.

Coated with a tough, long-wearing, oven-dried lacquer finish, this new tool is available in two popular sizes. . . . No. 2 for ⅛" to 2" pipe, and No. 4 for 2" to 4" pipe. Rugged but light—the shape has been specially engineered for added working comfort, balance, speed and easy handling.

Changes in cutting design permit power to be applied directly to the cutter wheel. There is no wasted pressure or effort.

The cutter wheel, being close to the slide track of the guide block, cuts down slide block wobble. Thus, there is excellent tracking and a finer degree of accuracy when pipe is cut.

Felix to Manage De Laval Pacific

De Laval Steam Turbine Co., Trenton, N.J., has announced the appointment of Samuel P. Felix as general manager of the De Laval Turbine Pacific Company. De Laval Pacific is a wholly owned subsidiary with main offices and plant located in San Francisco and district offices in Los Angeles and Seattle.

Mr. Felix joined De Laval as a test engineer at the Trenton plant in 1939, and later serving in various production and supervisory capacities. In 1941, he was given charge of the standard products machine shop, and appointed superintendent of the De Laval North plant in 1949.

Dearborn Elects Johnson to Board

Dearborn Chemical Company, Chicago, Illinois, has announced the election of Mr. S. C. Johnson as a member of its Board of Directors. Mr. Johnson is a Vice President of the Company and heads the Railroad Department, Eastern Division.

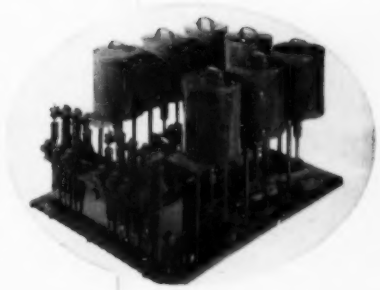
He joined Dearborn Chemical Company on January 1, 1930, as Railroad Service Engineer. On January 27, 1937, he was appointed Assistant to the Vice President. He was assigned to the position of Assistant Vice

UTMOST PROTECTION

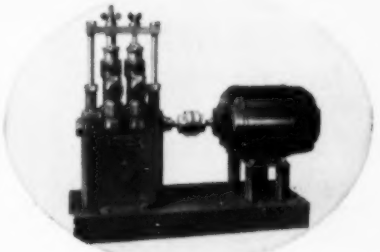
at lowest cost

Manzel CHEMICAL FEEDERS and HYPOCHLORINATORS

To the cost-conscious water and sewage treatment plant Manzel Feeders pay dividends in accuracy, dependability, and *surprising* economy of purchase and maintenance. Built by an organization famous for fifty years in the manufacture of automatic force feeding equipment, Manzel design is *thoroughly* proven. Whatever your feeding problem, ask Manzel.

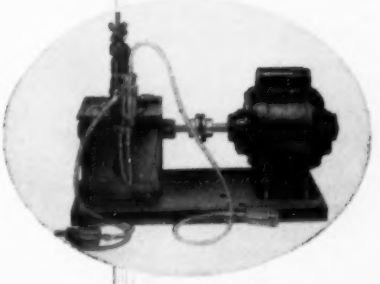


MULTI-FEED CHEMICAL FEEDERS
Any number of pumping units can feed the same or different chemicals simultaneously.



LARGE OR SMALL CAPACITIES
Various models pump from a fraction of a drop to 60 gph. All types of drives are available.

MANZEL HYPOCHLORINATORS
Positive, precise, and *low cost.* Easy to install and service.



Look at these Quality Features

- **Full control**... *accurate adjustment from 0 to full feed.*
- **Wide range** *of feed covers nearly every job.*
- **Positive in action**... *no clogging.*
- **Sight Feed** *and solution strainer.*
- **Easily adjusted** *while running.*

Manzel

3 Babcock Street, Buffalo 15, N. Y.

President, Railroad Department, Eastern Division, on January 25, 1939, and maintained that office until January 26, 1944, on which date he received his appointment as Vice President.

3 New Colors for Anti-Rust Paints

607

Paint Corporation of America, Cleveland, Ohio, has announced the addition of three new colors to the PCA anti-rust paint line.

Formerly available only in black, clear and aluminum, PCA paints are now also furnished in light gray, oxide red and chrome green.

Made with a special blend of vegetable oils including soya bean and processed Menhaden, plus rust-inhibiting chromates, PCA paints are reputed to stop rust for years in one application. The manufacturer states that they can be painted right over rusty surfaces without wire brushing, scraping or sandblasting and without the use of a primer coat of any kind. PCA paints are said to absorb surface rust, penetrate to the clean metal beneath, and seal it against further rust or corrosion. They resist moisture, mild chemicals and temperature changes.

Another
FIRST
FOR
SMITH-BLAIR...

NOW!
SMITH-BLAIR
Ductile Iron
TAPER SEAL
SERVICE CLAMPS!

For the first time, the amazing new material, ductile iron, is available in the complete line of Smith-Blair "Taper Seal" Service Clamps!

Ductile iron service clamps offer the important advantages of bronze — at less cost. They are stronger, more ductile — and have a corrosion resistance that is superior to malleable or cast iron.

Combined with the many advantages of the exclusive "Taper Seal" design — which makes possible a quick, easy installation with a more positive water seal — the Smith-Blair Ductile Iron Service Clamps set a new standard for the industry!

• Write today for complete information:

Another
FORWARD
STEP
For the
WATERWORKS
INDUSTRY

SMITH BLAIR INC.

MAIN OFFICE and FACTORY
P. O. BOX 666, SOUTH SAN FRANCISCO
BRANCH PLANTS: DOWNEY, CALIFORNIA
GREENSBURG, PENNSYLVANIA
DISTRIBUTORS IN PRINCIPAL CITIES

J. R. Howell

R. T. Dudley

Sterling Electric Motors Appoints Howell & Dudley

Sterling Electric Motors, Inc., Los Angeles, Calif. has announced that Mr. John R. Howell and Mr. Robert T. Dudley have been appointed Regional Sales Managers.

Mr. Howell will serve as Sales Manager for the western part of the United States and will operate from Sterling's Headquarters plant at 5401 Telegraph Road, Los Angeles while Mr. Dudley will serve as Sales Manager for the Eastern areas and will maintain an office at 6842 Ridgeland Ave., Chicago, Illinois. Both men will function as direct assistants to Alan J. Bronold.

John R. Howell has been associated with Sterling Electric Motors, Inc. for almost twenty-four years. He has a wealth of experience in all phases of the sales and management field. Mr. Howell has traveled extensively for Sterling and is familiar with the motor application problems of all industries.

Robert T. Dudley has been associated with Sterling since 1949 as District Manager in the company's Memphis office. His outstanding managerial and sales ability has been responsible for his rapid advancement.

New "Feather-Weight" Trouble Spotter

608

Jas. P. Marsh Corporation, Skokie, Illinois, has just developed a handy

(*Continued on page* 103A)

READER SERVICE CARDS for

WATER & SEWAGE WORKS

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Please fill out a separate coupon for each item on which you desire information. This will greatly facilitate handling.

Key number is at head of each new product, item of equipment, catalog or bulletin, described in this issue.

Enter key number in box.

Please PRINT your name and title, company or department name, and your address

NOTE—

These cards are to be used only for items described in THIS ISSUE

WATER & SEWAGE WORKS

Will see that you receive information desired.

(Continued from page 102A)

new tool, designed specifically for locating and diagnosing mechanical troubles through the medium of sound.

Based on proven scientific principles and engineered to a high degree of efficiency, this instrument is claimed by the manufacturer to be an excellent time and money saver in detecting and "Pin Pointing" imperfactions in all types of mechanical equipment. The sounds of leaking valves, turbulence, defective bellows, wrist pin and bearing knocks, piston slaps, grinding gears, valve noises, and a great many other mechanical difficulties can be detected and identified.

Weighing less than 12 ounces, the Marsh Soundscope consists of a comfortable ear-piece containing a soundbox system and transmitter, with a sensitive diaphragm capable of picking up sounds which cannot be heard by the human ear, and amplifying them until they are clearly audible. Simple, compact, and easy to use, this instrument comes packed in a handsome plastic carrying case.

J. V. Santry

M. H. Isenberg

Combustion Engineering-Superheater Shortens Name and Elects Officers

Combustion Engineering - Superheater, Inc., New York, N.Y., at a recent stockholders meeting voted to shorten the company name to Combustion Engineering, Inc.

At the same time the Board of Directors elected the following officers to new posts: Joseph V. Santry, president, was elected Chairman of the Board and will continue as Chief Executive Officer; Samuel G. Allen retired as Chairman of the Board but will continue as Chairman of the Executive Committee; Martens H. Isenberg, executive vice president, was elected president, succeeding Mr. Santry; George D. Ellis, vice president and controller, was appointed vice president in charge of finance, succeeding Harold H. Berry who has

CLARK SERVICE BOXES
Neat – Safe – Permanent
This cast-iron plug screws into brass insert... cannot be twisted or broken off.
Sliding adjustment prevents frost from disturbing base and curb cock.
Steel extension rod with welded joints—available with all types of boxes.
STYLE A—Clark Service Box for use with iron pipe.
STYLE B—for use with lead (illustrated) or copper pipe.
STYLE M—for use with Minneapolis Type Curb Stops.
write
H. W. CLARK CO.
MATTOON, ILLINOIS

reached the retirement age. Mr. Berry will continue as a director.

Mr. Santry has been with Combustion since 1915 and has served as an officer and director since 1918. He became executive vice president of the former Combustion Engineering Company, Inc. in 1933 and president in 1940. He was elected president of Combustion Engineering-Superheater, Inc. when Combustion was merged with The Superheater Company at the end of 1948.

Mr. Isenberg joined Combustion as an engineer in 1916 and was elected a vice president in 1928. He was made executive vice president in 1940 and has continued in this post up to the present. He was elected a director in 1951.

Mr. Ellis has ben associated with Combustion or affiliates since 1915. He was elected vice president and controller in 1948 and became a director in March of this year.

Aluminum Oxide Diffuser Plates

609

Electro Refractories & Abrasives Corp., Buffalo, N.Y. has developed an improved aluminum oxide plate for activated sludge process sewage disposal. The new plate holds the promise of bettering operating efficiency of large city plants up to 20 per cent.

That is the claim of the company which says there is a potential savings of "tens of thousands of dollars" annually for each large disposal plant converting to the new tile.

The new diffuser is credited with producing at desired air volume a uniform profusion of small bubbles that do a better job of oxidizing the wastes. Increased efficiency of some 20 per cent is claimed for the tile that must pass 80 cubic feet of air per minute. For 40 cubic feet tile, the boost is approximately seven per cent.

Field tests in a large mid-Western city revealed the tile is not only more efficient, but is also inert to both acids and alkalis.

with Fast Flexible
BUCKET MACHINE CLEANING

"9,000" POUND PULL
Lifts Any Bucket That Will Pass a 24" Manhole Cover.

Here is the fastest *plus* operating bucket machine on the market. It's proven, trouble-free, patented belt-drive is much superior to transmission-operated machines.

Only one lever to use (instead of three)--which protects operator, pipe and machine. Why put up with summer sewer smells when Flexible cleans thoroughly--so economically? Let us prove it with facts and figures

WRITE today

Flexible
SEWER-ROD EQUIPMENT CO.
9059 VENICE BOULEVARD, LOS ANGELES 34, CALIF.

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P. O. Box 465 — Memphis, Tennessee
1115 Delaware Ave. — Fort Pierce, Fla.
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200 Magee Bldg. — Pittsburgh, Penn.
66 Kinlry Drive — Rochester 9, New York
29 Cerdan Avenue — Roslindale 31, Mass.
801 E. Excelsior Blvd. — Hopkins, Minn.
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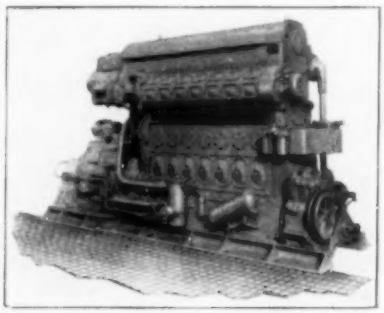
4455 S.E. 24th Street — Portland, Oregon
351 West Jefferson Blvd. — Dallas, Texas
Francis Hankin — Montreal & Toronto, Canada

AMERICA'S LARGEST MANUFACTURER
OF PIPE CLEANING TOOLS AND EQUIPMENT



Small, Heavy-Duty Opposed-Piston Diesel

610

Fairbanks, Morse & Co., Chicago, Ill., has announced the development of a new opposed-piston diesel designed for heavy-duty applications although it is a fraction of the size and weight of conventional heavy-duty engines.

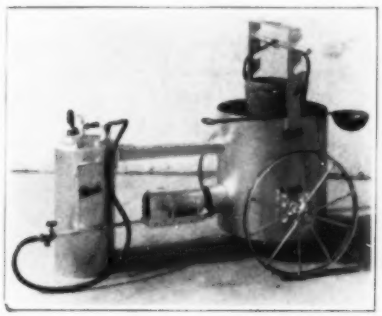
The new Model 38F5¼ diesel has a 5¼ in. bore and 7¼ in. stroke and develops a continuous duty rating of 75 hp. per cylinder at 1200 r.p.m. Although the engine is compact and light (the 225 hp. unit weighs 7100 pounds), the builder has not sacrificed strength at any point.

The engines are complete self-contained units incorporating all necessary pumps, heat exchangers, filters and other auxiliaries for the pressure lubrication system, the closed cooling water circuit, and the diesel mechanical injection fuel system. Also built-in is the rotary scavenging air blower. The engine also can be equipped for dual-fuel and spark-ignition gas operation. Mounting of accessory equipment on the engine is another means of reducing space requirements and cutting installation costs.

Rockwell Names Hoyt To Water Meter Division

Rockwell Manufacturing Co., Pittsburgh, Pa., has announced the appointment of John G. Hoyt Jr., a district sales supervisor of Rockwell Manufacturing Company's Water Meter Division, as assistant sales manager of the division.

Mr. Hoyt has been attached to the company's Houston, Texas district sales office since 1942 and has served as district supervisor of water meter sales there for the past year. He joined Rockwell in 1941 through a merger with National Meter Company, with which he had been affiliated in Houston since 1939.



Portable Lead or Compound Melting Furnace

611

Aeroil Products Co., Inc., South Hackensack, N.J., has developed an improved type of heavy duty portable lead or jointing compound melting furnaces in capacities of 200 lbs., 450 lbs. and 850 lbs. The units provide for melting of 200 to 800 lbs. of lead in from 8 to 35 minutes.

Considered ideal for pipe line work or on jobs where the furnace must be moved frequently, portability on job —even when burner is in operation— creates no problem whatsoever.

And, according to the company, users have a choice of either kerosene-fired furnaces or can have them equipped with burner for LPG, Propane, Butane or any of the bottled gases sold now in practically all sections of the country.

Beckman Assigns Posts For New Field Engineers

Beckman Instruments, Inc., South Pasadena, Calif., has announced the

TURN SEWAGE SLUDGE INTO DOLLARS

You can convert your sewage sludge into dollars and easily—with a Royer Sludge Disintegrator. Sludge cake with as much as 56% moisture content can be shovelled into the Royer, chemicals added if desired, and a marketable fertilizer is discharged to bag, pile or truck. Materials are completely shredded, pulverized, blended and aerated, with all sticks, stones and trash removed.

Eliminate the cost of burning, burying or hauling your sludge and at the same time build up a source of steady income. This nitrogen rich, valuable plant food is readily saleable to gardeners, golf clubs, florists and nurserymen.

Write for the Sewage Sludge Datalog giving complete details on electric motor, gasoline engine or belt-to-tractor driven models, in capacities to suit your requirements.

Illustrated above, a Royer S-Jr. at an Oregon sewage plant.

ROYER

PIONEERS IN THE SALVAGE OF SEWAGE SLUDGE

ROYER FOUNDRY & MACHINE CO.

170 PRINGLE ST., KINGSTON, PA.

HYDRO-TITE

DEPENDABLE JOINTING COMPOUND

Seals Bell and Spigot Water Mains

Economical—Effective

Over 35 Years Of Dependable Performance

HYDRAULIC DEVELOPMENT CORP.

MAIN SALES OFFICE 50 CHURCH ST., N.Y.C.

General offices and works W. Medford Sta., Boston, Mass.

assignment of 20 new field engineers to district offices throughout the U.S. and Canada.

The graduates represent a threefold expansion of the company's national field staff. They will provide a direct factory contact for users and distributors of Beckman scientific and industrial control equipment.

Originally screened on the basis of scholastic achievement and practical experience, the graduate engineers successfully completed nearly 500 hours of study in the operation, performance and field maintenance of Beckman spectrophotometers, pH meters and related instruments.

K. J. Plants Appointed N.Y. District Manager

Sterling Electric Motors, Inc., Los Angeles, Calif., has announced the appointment of Mr. Kenneth J. (Jack) Plants as District Manager for the New York Office of the company.

"Jack" Plants is a native of Hornell, New York and was educated at Lawrenceville Prep. and Princeton University. Previous to his appointment with Sterling, he has been Sales Manager of Goodyear Rubber Sundries, New York District Manager for Reynolds Metals and for the Plastics Division of the Firestone Tire and Rubber Corp. He brings to Sterling a wealth of experience in the industrial management and sales field, and is prepared to render motor application service to the industrial and commercial needs of the area.

DOES IT control chlorine gas in the dry, non-corrosive state?

DOES IT meter chlorine gas with a true flow indicator?

DOES IT work the same winter and summer — without chlorine hydrate troubles?

DOES IT automatically prevent bothersome chlorine odors?

DOES IT have an easy-to-seal chlorine flow system free from stuffing boxes?

IS IT easily adapted to program or flow proportional control?

IS IT easy to understand and easy to operate?

IS IT low on maintenance?

Will your Chlorinating Equipment Pass This Test

Put Builders Chlorinizer to the test in your plant! See how this modern chlorine gas feeder answers every requirement for safe, reliable, low-cost, low-maintenance chlorination. Send for Bulletins 840-F1B, 840-J30, 840-J8. Builders-Providence, Inc., 350 Harris Ave., Providence 1, Rhode Island.

BUILDERS

IRON INDUSTRIES PIONEERS IN METERS • FEEDERS • CONTROLS BUILDERS

Electronic Air Filter

612

American Air Filter Co., Inc., Louisville, Ky., has developed the Electro-PL, dry-type, high efficiency, electronic air filter.

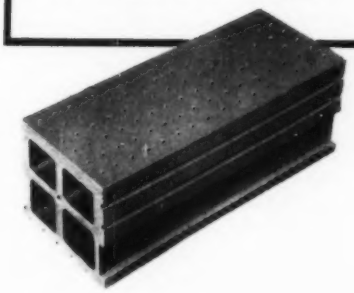
The filter is basically an electronic precipitator without an ionizing unit. The cleaning media, Airmat, is a cellulose product composed of several plies of porous tissue-thin sheets to which an electrical charge is applied, thus increasing its collection efficiency into the range of smoke particles which average ¼ micron in size.

The filtering media is replaced with a new Airmat after it collects its dust load, thereby eliminating the need for drainage and water connections for reconditioning. If, for any reason, the electronic action should become inoperative, the air will continue to be filtered by one of the media.

Olson and Others Advanced by National Supply

The National Supply Company, Springfield, Ohio has announced that Charles K. Olson, Jr., has been named Manager of Sales for the Engine Division. He had been Assistant General Manager of the Division since November, 1951.

IT PAYS TO *Specify*
LEOPOLD
Glazed Tile
FILTER BOTTOMS



PERFORMANCE PROVED IN OVER 200 PLANTS WITH A DAILY CAPACITY OF MORE THAN 900 MILLION GALLONS!

With its many exclusive advantages, the Leopold Compound Duplex Filter Bottom provides the most practical and economical answer to your underdrain problems.

In this design, laterals and distributing blocks are combined in one permanent unit that insures uniform filtration over the entire filter bed and equal distribution of the wash water with minimum loss of head. The individual blocks—each about two square feet in area and weighing approximately 100 pounds—are made of highest quality de-aired fire clay, vitrified and salt glazed. They resist corrosion, are not subject to tuberculation, won't absorb any detrimental amount of water, and are impervious to acids and alkalis.

Adaptable to any rectangular filter unit, the efficient Leopold Filter Bottom needs only a shallow depth of small sized filter gravel to support the filtering medium. Further, the Leopold design does not require special supporting concrete members or the added concrete construction of a false bottom.

Complete Water Purification and Sewage Plant Equipment . . .

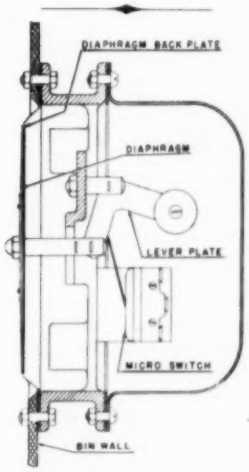
- **DRY CHEMICAL FEEDERS**
- **FILTER OPERATING TABLES**
- **MIXING EQUIPMENT**

Write today for details

F. B. Leopold Co., Inc.
2413 W. Carson Street
Pittsburgh 4, Pa.

Other advancements are: Robert M. Pearson, for the past ten years Manager of Sales, has been named Manager—Inland Marine Sales for the Engine Division. He will have his headquarters in Pittsburgh, Pa. Mr. Pearson has been with National Supply for seventeen years.

Philip W. Place, formerly Staff Assistant to the General Manager, has been named Assistant to the Manager of Sales, with responsibility for General Service. J. H. Newton, who joined National Supply in 1948, and who since then has had increasingly important functions as Applications Engineer for the Engine Division, has been named Staff Assistant to Manager of Sales.



Prices Lowered on Bin-Dicators

613

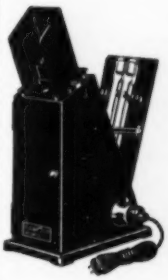
Bin-Dicator Company, Detroit, Michigan, has announced new lower prices on certain widely used Bin-Dicators (bin Level indicators).

The price reduction applies to Bin-Dicator Models A and C with general purpose MICRO switch, which are now priced the same as similar units with mercury switch. The lower prices are possible because of improvements in design and simplification, which at the same time improves the performance of these units.

Improvements applying to all models consist of modified frame design which permits easier access to operating mechanism and wiring connections, better and simpler switch installation, and greater flexibility in wiring and conduit installations. Units equipped with the mercury switch, general purpose MICRO switch, and explosion-proof MICRO switch also have a new diaphragm back plate which increases sensitivity and limits diaphragm travel to the minimum necessary for switch actuation.

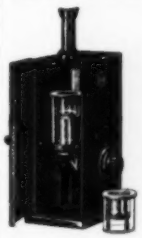
Dependable
HELLIGE
Water Testing Equipment
USED WITH CONFIDENCE . . . EVERYWHERE

COLORIMETRIC COMPARATORS
Employing
GUARANTEED NON-FADING Glass Color Standards
for pH, Chlorine, and 22 other important Tests.



AQUA TESTER for Analyses of Water, Sewage, and Industrial Wastes
Employs GUARANTEED NON-FADING Glass Color Standards for 30 tests including pH, Fluoride, Iron, Color of Water, etc. . . . Uses Approved A.P.H.A. and A.W.W.A. Methods.

"Chromatron" PHOTOELECTRIC COLORIMETER & TURBIDIMETER
for Diverse Water and Sewage Tests.



TURBIDIMETER
The Turbidimeter **Without** Standards
for Turbidity Measurements and Sulfate Determinations.

TWIN-KIT for
pH Control and Chlorine or Bromine Determinations of Swimming Pool Water with GUARANTEED NON-FADING Glass Color Standards.

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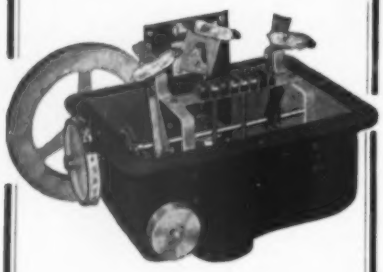


RF-2

WITH ALTO-TROL

This 2-pump RF-2 Roto-Trol assures equal use and wear of both pumps. Each pump is operated on alternate starting cycles. The RF-2 operates both pumps together, when required. RF-2 installations give dependable service year after year, with the minimum of attention.

Write for full data

WATER LEVEL CONTROLS DIVISION

HEALY-RUFF COMPANY

783 HAMPDEN AVE., ST. PAUL 4, MINN.

LEADITE

The Pioneer Self Caulking Material for C I Pipe

Thousands of miles are—

Jointed with LEADITE for *Satisfaction and Long Life*

because Leadite makes a good, tight joint that improves with age . . . and in addition, saves on installation costs.

Write for Literature.

THE LEADITE COMPANY

Girard Trust Co. Bldg., Philadelphia 2, Pa.

No Caulking

Literature & Catalogs

Underground Pumping Stations

614

Smith & Loveless, Inc., Kansas City, Mo., has released a folder on **Underground Pumping Stations** for automatic drainage of sewage and and storm water.

This folder gives a complete cut-away drawing of the installation with keyed text explaining the operation of the unit.

The balance of the fol voted to technical data on t built pumping station. Com fications and selection cha cluded. Dimensional drawi complete installation and chart for the wet well co folder.

Compound Meters

615

Badger Meter Mfg. Co. kee, Wisconsin, has release on **Badger Water Meters, C**

The folder discusses the tion features of the meters dimensions and capacities teresting insert in the fold page blueprint showing how works on the valve side an bine side. The drawings and a complete explanatio on the bottom of the bluep

Wood Laboratory Equi

616

Kewaunee Mfg. Co., Adr igan, has available a complete catalog on **Wood Laboratory Equipment.**

This 300-page catalog contains the complete line of equipment for: educational laboratory layouts; standard units; service fittings; sinks; fume hoods; science equipment; homemaking equipment, industrial arts equipment and miscellaneous equipment.

Complete specifications and a cross index are also included.

Turbine Meters

617

Worthington-Gamon Meter Company, Newark, N.J., has released a folder on **Turbine Meters.**

The folder devotes one page to the design and construction features of the meters. The balance of the folder

M-SCOPE Pipe Finder

LIGHTWEIGHT MODEL

One Man Operation

HIGHLY EFFICIENT

IMMEDIATE SHIPMENT

WAY

PAG

Fresh water in large silver flagons accompanied Persia's Cyrus the Great when he made war on his enemies. Drawn by mule cart, the water was boiled to make it "keep".
For excellence in MODERN water treatment equipment — gravity and pressure filters—recirculation apparatus . . .

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO DARBY, PENNA.

ROBERTS FILTER MFG. CO.

607 Columbia Ave.

Darby, Pa.

3way
dependability
is built into ALL
EDDY
VY
GES

easily *with* the pressure . . . and close without water hammer.

2. **IN CASE OF ACCIDENT**—stem held in place below main valve means no water loss due to a bent stem. One man can easily remove all operating mechanism for inspection or repairs.
3. **FREEZE PROOF**—Eddy's positive drip action automatically drains hydrant barrel of all water when hydrant is closed . . . safeguards hydrant against freeze-ups.

EDDY
VALVE COMPANY
A Subsidiary of
James B. Clow & Sons
WATERFORD, NEW YORK

shows keyed line drawings that explain and list all the parts of the meters. Ratings, loss of head charts and elevation, dimension and weight charts complete the folder.

Vacuum Chlorinator

618

Wallace & Tiernan, Newark, N.J., has available a bulletin on its **Air-Operated Master Visible Vacuum Chlorinator.**

The bulletin discusses the design and construction, adaptability and control, operation and special features of the chlorinator. Line drawings, charts and photographs amplify point made in the text.

ter Meters

619

ell Machinery & Supply Co., Inc., Worth, Texas, has available a klet on **Calmet, the Precision t Water Meter.**

his attractive 20-page booklet disses in great detail the various coment parts of the meter. Cut-away wings illustrate each part. Com- pages are devoted to: the regis- stuffing box; gear train; piston; suring chamber; outer case; and st-free features.

list of the materials used in the nufacture of the meters, complete ifications and prices complete the klet.

History of Bitumastic

620

Koppers Company, Inc., Pittsgh, Pa., has released a booklet on **umastic.**

This booklet presents the 100-year history of Bitumastic enamels in a few pages. Profusely illustrated with photographs, it shows applications from the 1850's up to today. Of especial interest is the comparison of the old time plants and methods of application with today's modern high-speed operations.

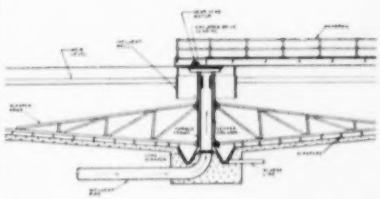
Hydraulic Tables & Engineering Data

621

Sparling Meter Company, Los Angeles, Calif., has available a bulletin containing **Engineering Data and Hydraulic Tables.**

This 26-page bulletin contains practically all the information that would be used in the daily operations of a water or sewage plant. A few of the

Center-Feed
Center-Discharge
Clarifiers



One reason for the efficiency of Hardinge Clarifiers is the fact that the influent goes directly to a central stilling well and the underflow also is centrally removed. This promotes quick disposal of the heavier solids immediately upon entry—makes less work for the rotating sludge scrapers. The clear effluent overflows the tank periphery, where velocity is at a minimum. Bulletin 35-C-15.

HARDINGE
COMPANY, INCORPORATED
YORK, PENNSYLVANIA—240 Arch St. Main Office and Works
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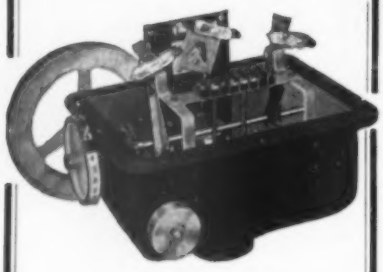
ROTO-TROL



RF-2

WITH ALTO-TROL

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Write for full data

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LEADITE

The Pioneer Self Caulking Material for C I Pipe

Thousands of miles are—

Jointed with LEADITE for *Satisfaction and Long Life* because Leadite makes a good, tight joint that improves with age . . . and in addition, saves on installation costs.

Write for Literature.

THE LEADITE COMPANY

Girard Trust Co. Bldg., Philadelphia 2, Pa.

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Literature & Catalogs

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The balance of the folder is devoted to technical data on this factory built pumping station. Complete specifications and selection charts are included. Dimensional drawings of the complete installation and a design chart for the wet well complete the folder.

Compound Meters

615

Badger Meter Mfg. Co., Milwaukee, Wisconsin, has released a folder on **Badger Water Meters, Compound.**

The folder discusses the construction features of the meters and gives dimensions and capacities. An interesting insert in the folder is a 2-page blueprint showing how the meter works on the valve side and the turbine side. The drawings are keyed and a complete explanation appears on the bottom of the blueprint.

Wood Laboratory Equipment

616

Kewaunee Mfg. Co., Adrian, Michigan, has available a complete catalog on **Wood Laboratory Equipment.**

This 300-page catalog contains the complete line of equipment for: educational laboratory layouts; standard units; service fittings; sinks; fume hoods; science equipment; homemaking equipment, industrial arts equipment and miscellaneous equipment.

Complete specifications and a cross index are also included.

Turbine Meters

617

Worthington-Gamon Meter Company, Newark, N.J., has released a folder on **Turbine Meters.**

The folder devotes one page to the design and construction features of the meters. The balance of the folder

M-SCOPE Pipe Finder

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Catalog No. 25G On Request

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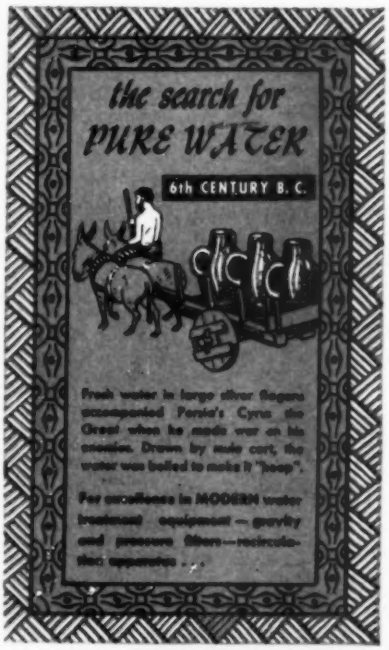

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EDDY VALVE COMPANY
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shows keyed line drawings that explain and list all the parts of the meters. Ratings, loss of head charts and elevation, dimension and weight charts complete the folder.

Vacuum Chlorinator

618

Wallace & Tiernan, Newark, N.J., has available a bulletin on its **Air-Operated Master Visible Vacuum Chlorinator.**

The bulletin discusses the design and construction, adaptability and control, operation and special features of the chlorinator. Line drawings, flow charts and photographs amplify each point made in the text.

Water Meters

619

Well Machinery & Supply Co., Inc., Fort Worth, Texas, has available a booklet on **Calmet, the Precision Built Water Meter.**

This attractive 20-page booklet discusses in great detail the various component parts of the meter. Cut-away drawings illustrate each part. Complete pages are devoted to: the register; stuffing box; gear train; piston; measuring chamber; outer case; and frost-free features.

A list of the materials used in the manufacture of the meters, complete specifications and prices complete the booklet.

The History of Bitumastic

620

Koppers Company, Inc., Pittsburgh, Pa., has released a booklet on **Bitumastic.**

This booklet presents the 100-year history of Bitumastic enamels in a few pages. Profusely illustrated with photographs, it shows applications from the 1850's up to today. Of especial interest is the comparison of the old time plants and methods of application with today's modern high-speed operations.

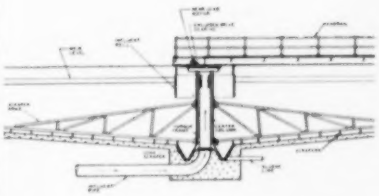
Hydraulic Tables & Engineering Data

621

Sparling Meter Company, Los Angeles, Calif., has available a bulletin containing **Engineering Data and Hydraulic Tables.**

This 26-page bulletin contains practically all the information that would be used in the daily operations of a water or sewage plant. A few of the

Center-Feed
Center-Discharge
Clarifiers



One reason for the efficiency of Hardinge Clarifiers is the fact that the influent goes directly to a central stilling well and the underflow also is centrally removed. This promotes quick disposal of the heavier solids immediately upon entry—makes less work for the rotating sludge scrapers. The clear effluent overflows the tank periphery, where velocity is at a minimum. Bulletin 35-C-15.

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● If interested in equipment or literature mentioned below, mail a Reader Service Card with your name, address, and item key number.

friction loss; horse power, theoretical requirements for raising water; pump operating costs; water requirements; correct sizes of wire; etc.

This bulletin should make a welcome addition to the engineers or operators library.

Problems Solved at Water Plant

622

Beckman Instruments, Inc., South Pasadena, Calif., has available a series of **Application Data Sheets** that discuss various problems encountered at the Long Beach Water Treatment Plant, Long Beach, Calif.

The data sheets give the problem encountered, the solution of the problem and pertinent comments. Problems covered are: maintenance of accurate pH control; determination of chloride content of water supply; determination of sodium and potassium at various stages of treatment; and determination of total alkalinity of water at various stages of treatment in the plant.

Water Level Controls

623

Healy-Ruff Company, St. Paul, Minn., has released a folder on **Water Level Controls.**

The folder, consisting of a series of 9 bulletins discusses: Roto-Trols for elevated tanks, standpipes, reservoirs; Roto-Trols for hydro-pneumatic or pressure tanks; Roto-Trols for sewage pumps, programming control; sequence control; single pump control; pressure operated sump control; automatic alternator; electric time delay; and remote controller accessories.

Illustrated with photographs and line drawings, the folder also contains specifications and prices.

Sewer Cleaning Equipment

624

Turbine Sewer Machine Co., Milwaukee, Wis., has available a catalog listing the **Complete Sewer Cleaning Equipment** manufactured by the company.

The 50-page catalog illustrates and discusses Turco Maxi-Power sewer cleaning units; Turco derrick boom; Turco robot; windlasses; bucket systems; manhole guide jacks; cables; different types of buckets; sewer flushing equipment; sewer rods; pro-

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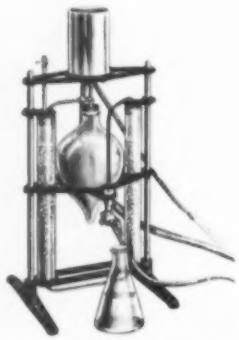

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pelling nozzles; diaphragm and centrifugal pumps. All accessories for this equipment are also discussed. A complete price list is also included.

Water Works Supplies

625

Smith-Blair, Inc., South San Francisco, Calif., has released a general catalog on **Water Works Supplies and Specialties.**

This 85-page catalog covers the line of water works supplies manufactured by the company. Among the items listed, pictured and described are: pipe repair clamps; pipe repair lugs; sheet metal; sheet-rubber packing; fast action repair clamps; full-circle clamp couplings; flexible couplings; service clamps; water-lock rings; flexible service couplings; etc.

Complete order blanks and a discount sheet for quantity orders are also included.

Seal-Less, Leakproof "Chempump"

626

Chempump Corp., Philadelphia, Pa., has just published a bulletin on the **Chempump.**

The bulletin describes the new magnetically driven combined motor and centrifugal pump which requires no mechanical seals or stuffing. Also included are dimensional drawings, vacuum performance charts and performance curves for all models.

Self-Cleaning Strainers

627

S. P. Kinney Engineers, Inc., Carnegie, Penna., has just published a 12-page booklet on **Self-Cleaning Strainers.**

The booklet contains complete descriptions, illustrations, diagrams, and pertinent engineering data regarding the Brassert Automatic Self-Cleaning Strainer; the Kinney Automatic Self-Cleaning Strainer; and the Kinney Manually-operated Self-Cleaning Strainer.

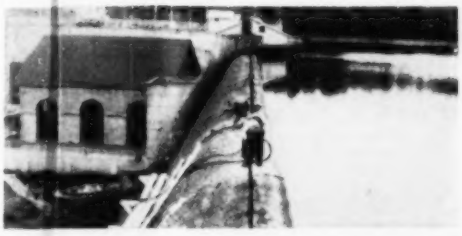
According to the booklet, these strainers are constructed in 2 to 36 inch pipeline sizes and will remove fine suspended particles from raw or process water, oil, gasoline, alcohol, and other liquids.

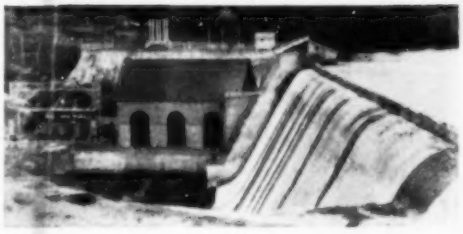
Air-Operated Controls

628

Bristol Company, Waterbury, Conn., has just released a new 32-

CEMENT GUN CO. RESTORES DAM WITH "GUNITE"





The photographs, at left, show a large Ambursen type dam in Northern New England which has been reintegrated with "GUNITE."

The top photograph shows the spalled and eroded condition of the concrete when the Cement Gun Company crews arrived on the job. The surface was chipped back to sound concrete and reinforcing mesh applied. Then the entire downstream surface was blanketed with "GUNITE."

The bottom photograph shows the completed "GUNITE" surfacing of the dam.

This is typical of many dams which we have restored throughout the country.

Many similar examples of repair, remodeling and new construction with "GUNITE" are described and pictured in Bulletin C2400. A request on your letterhead will bring a free copy by return mail.

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page bulletin describing **Free-Vane Air-Operated Controllers.**

Instruments for automatic control of pressure, temperature, liquid level, flow, humidity, pH, and electrical variables are described. Among the new products described are time-program controllers, electronic Dynamaster Potentiometers and bridge instruments in air-operated control models.

The fully-illustrated bulletin gives complete data on on-off proportional, reset, derivative, reset plus derivative, and autoset types of controllers.

Diesel, Dual Fuel, and Spark Ignition Engines

629

Worthington Corporation, Harrison, N.J., has released a new bulletin entitled **"New Developments in Oil Diesel, Dual Fuel Diesel and High Compression Spark Ignition Engines."**

The bulletin, describes and illustrates up-to-date features of modern, economical, heavy duty, internal combustion engines. It includes a heat balance chart illustrating waste heat recoverable from exhaust gases and jacket cooling water. Accompanied by fuel cost charts for determining most economical type of engine selection, and reprints describing industrial and municipal installations utilizing heat recovery systems resulting in engine thermal efficiencies of approximately 75%.

Included with Bulletin S-500-B55 are: Bulletin S-500-B54, with fuel cost charts mentioned above; RP-492, Hyperion Sewage Disposal Plant (Los Angeles); and RP-481, "Diesels Make Potash in Utah."

Engineering Bulletin On Cooper-Bessemer Engines

630

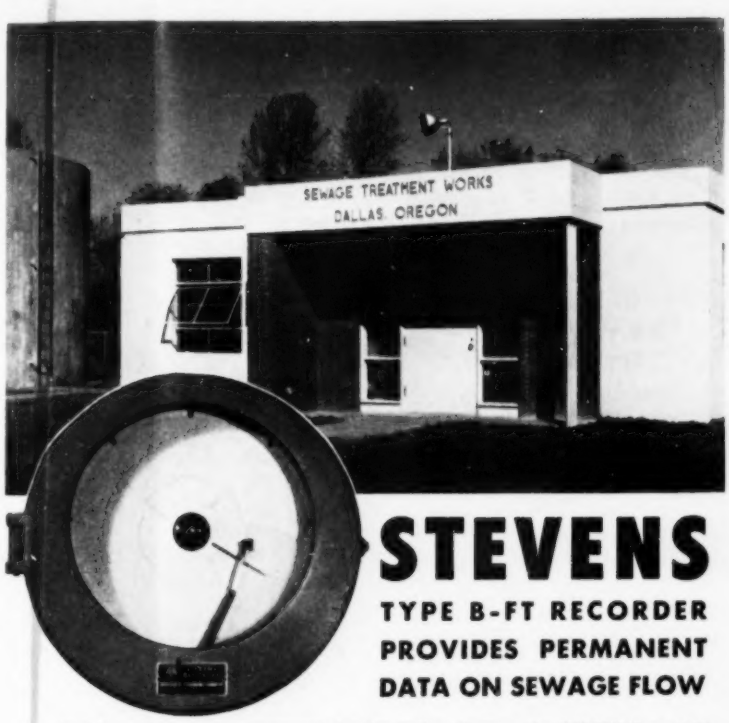
The Cooper-Bessemer Corporation, Mount Vernon, Ohio, has just released a new general bulletin on **Type LS Engines.**

The bulletin provides complete data and specifications of Cooper-Bessemer 4-cycle Type LS engines of 15½" bore and 22" stroke. Engines are operated by Gas, Gas-Diesel and Diesel, atmospheric or supercharged, and are rated from 690 to 2500 H.P.

Cathodic Protection

631

Electro Rust-Proofing Corp., (N.J.) Belleville, New Jersey has



STEVENS

TYPE B-FT RECORDER PROVIDES PERMANENT DATA ON SEWAGE FLOW

At this modern sewage treatment plant in Dallas, Oregon, the STEVENS Type B-FT Recorder provides a permanent graphic record of flow in million gallons per day (range 0-6 MGD) and totalizes the volume in gallons. The STEVENS Recorder is mounted over a stilling well connected to a 9" throat width Parshall flume.

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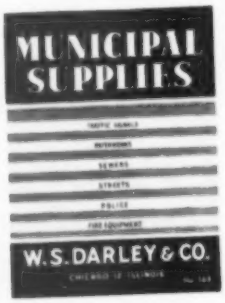

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Engineers and Sales Agents

just released a folder on **Cathodic Protection for the Treatment Plant.**

This attractive folder discusses: The corrosion problem and cathodic protection; what ERP cathodic protection will do; where it should be used; when it should be applied; how it should be installed; and how much it will cost. Photographs of actual installations in water and sewage plant treatment units are included.

Pipe-Laying Instruction Booklet

632

Price Brothers Company, Dayton, Ohio, has just published a booklet on **Concrete Pressure Pipe Laying Instructions.**

The booklet, using everyday workman's language, explains each step with a maximum of four short, to-the-point paragraphs covering each operation. Actual on-the-job photographs illustrate each step and there are no complicated diagrams; only simplified sketches of equipment.

Builders Iron Foundry Product Index

633

Builders Iron Foundry, Providence, R.I., has just published a new **Products Index** covering equipment manufactured by Proportioneers, Inc., Omega Machine Co., and Builders-Providence, Inc., the 3 subsidiary companies.

The catalog illustrates each item and accompanies it with a short description. Numbers of the specific bulletins referring to each item are also given. The back page is devoted to a list of agents and representatives of the companies along with their addresses.

Hypochlorinator

634

Manzel, Buffalo, N.Y., has available a fact sheet on the **Manzel Hypochlorinator.**

The fact sheet discusses: feed regulation; liquid gland; packing; valves; priming; restarting feeder; intake; discharge; and flushing feeder. An explanatory line drawing is also included on the sheet.

Pneumatic Sewage Ejector

635

Blackburn-Smith Manufacturing Co., Inc., Hoboken, N.J., has available a bulletin on **The Blackburn-Smith Pneumatic Sewage Ejector System.**

This 12-page, 2-color, bulletin discusses the applications, advantages, and design data of pneumatic sewage ejector equipment. Also included are piping and wiring diagrams for all different types of ejector systems and dimensional lay-outs for the single and duplex units. Complete specifications and a partial list of Blackburn-Smith ejector system users complete the bulletin.

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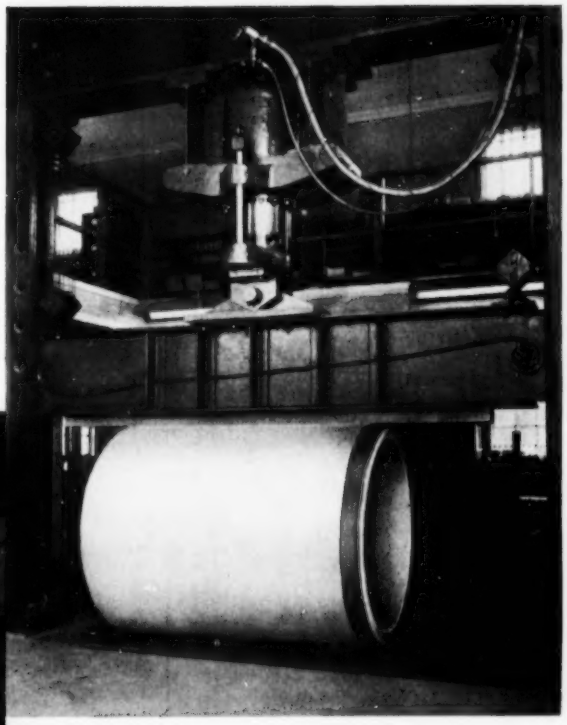

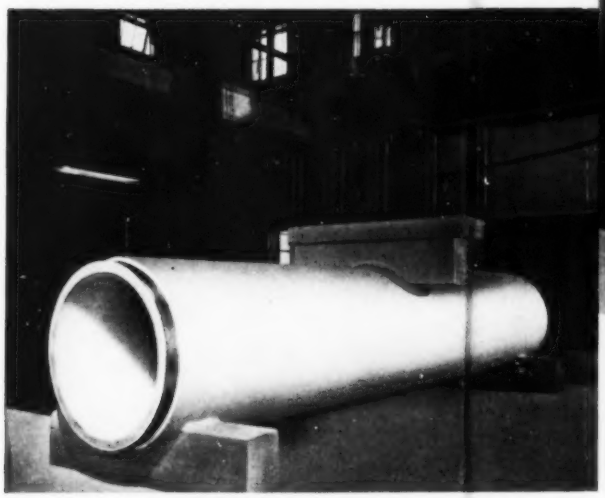

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